VOLUME 40
NUMBER 7

JULY, 1953

plating

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NICKEL PLATING OF ALUMINUM PROPELLER BLADES

See Contents Page 759

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Troubled with
BLISTERING *and*
PEELING *of Paint*
from Steel

Then we would recommend **CLEPO-PHOS** *treatment of the Steel before Painting.*

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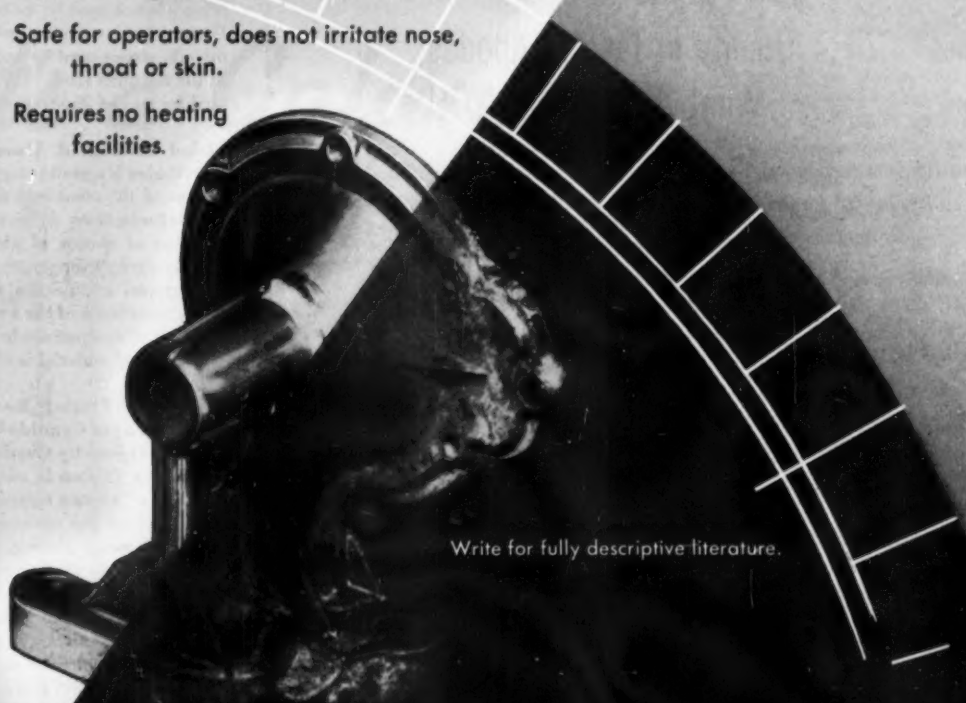

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In This Issue

Polarographic Determination of Zinc in Alkaline Zinc Plating Solutions by Rafael Diaz and E. H. Lindemann is a paper, the third of a series in this field published within recent months in this journal, which describes an analytical control method employing the polarograph for the analysis of zinc in zinc plating solutions. Three tables and two figures illustrate the story.

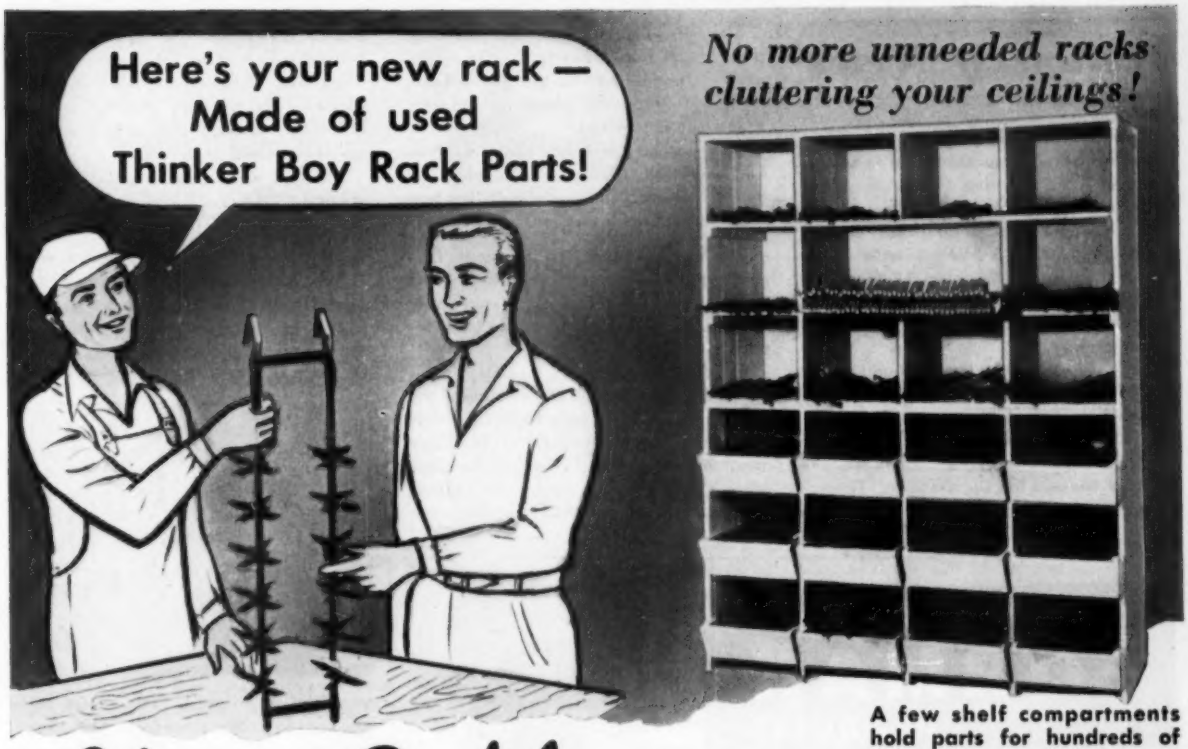
A Flexible Plated Circuit by E. R. Bowerman and R. F. Walton is a paper which describes a cloth backed plated circuit made by a transfer process by which a strippable copper electrodeposit and a thin polyvinyl resist are transferred to a cloth adhesive tape from a stainless steel base. The stainless steel is reusable and its surface may be patterned to identify the wiring on the unit being produced. The transfer method eliminates the need for providing, between the wires, of conductive bridges which have to be removed later. Design changes require only a change in the silk screen used to apply the resist to the stainless steel. Three figures are used by way of illustration.

Nickel Plating of Aluminum Propeller Blades is a photo story relating the success of the combined efforts of several organizations in overcoming the problems of erosion of aluminum in a special aircraft application. Eleven photographs outline the process steps and present some of the test procedures involved. A comparison between plated and unplated material is shown.

Disposal of Plating Room Wastes. VI. Treatment of Cyanide Waste Solutions with Ozone by Charles A. Walker and Walter Zabban is another Project 10 paper. This one represents the second report on the removal of cyanide ions from waste plating solutions by reaction with an oxidizing agent. The authors conclude that the oxidation of free and complex cyanide ions by ozone results in the formation of free cyanate ions, insoluble metallic cyanates and hydroxides. The reaction is very rapid, but does not seem to proceed beyond the cyanate stage. One figure and 12 references are included in the report.

For page numbers, see Table of Contents, page 739

Published monthly at 5800 N. Marvine St., Philadelphia 41, Pa. Entered as second class matter July 1, 1946, at the Post Office at Philadelphia, Pa., under Act of August 24, 1916. Subscriptions: Domestic and Canada, $4.00 for 1 year, $7.00 for 2 years 50c per copy; Foreign, $8.00 per year, $1.00 per copy



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Industry News

New England Lead Burning Corporation Adds Texas Branch. The New England Lead Burning Corporation, located in St. Louis at 4975 Fyler Ave., has acquired two acres of ground in the highly industrial Northeast section of Houston, close to the ship Channel at 4600 Homestead Road where a new plant is being erected, 168 feet long, all under one crane way.

They plan to fabricate steel tanks, also have a lead lining division and have been awarded the licensed applicator franchise for "Koroseal" from the B. F. Goodrich Company. They will be the only applicators for Korosel for the states of Texas, Louisiana and Oklahoma.

They also plan to manufacture a complete line of lead X-ray protective equipment. In addition to the above lines, they will serve the plumbing industry where lead is required.

The company now has plants at Boston, Buffalo, St. Louis, Los Angeles, and San Francisco. Manager of the new Houston plant will be Carl C. Cooper.

Big Nickel Deposit Discovered. Discovery in Cuba of a large deposit of nickel ore, a major new source of this critically short metal has been announced by Freeport Sulphur Company.

Extensive exploration recently completed has established the existence, the company said, of at least 40,000,000 tons of nickel ore in the vicinity of Moa Bay about 500 miles east of Havana. Freeport officials believe that, except for certain deposits in Canada, the Moa Bay ore bodies constitute the most important proven source of nickel anywhere in the free world. The company will build a pilot plant for the recovery of nickel and also of cobalt, another scarce and urgently metal contained in the ore.

The new deposit at Moa Bay averages about 1.35 per cent nickel and about 0.14 per cent cobalt.

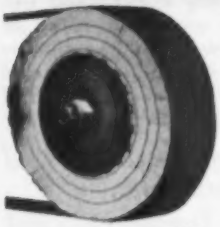
New Construction. Enthone, Inc., New Haven, Conn., announces the completion of increased manufacturing and warehousing facilities at their plant in the form of a two-story addition to their

group of buildings. The added area amounts to 6,600 square feet. At the present time, the ground floor of the new building is being used for warehousing and for an enlarged shipping and receiving department. The entire second floor of the new structure is to be used for the new research and development and the customer service laboratories of the company which will be ready for occupancy in 1954.

New Plant for Globe Compound Company. The Globe Compound Company, Waterbury-Bristol Rd., Wolcott, Conn., announces the completion of a new factory and office building at the above address. The modern fireproof structure affords greatly expanded facilities for production, laboratory research and technical services in the field of buffing and metal finishing compositions.

Many novel features in building construction have been incorporated to provide for future expansion and operating conveniences. Ceilings are constructed of insulated prefabricated cement slabs and floors are clear of all posts. Lighting fixtures are mounted on tracks and can be moved to any location.

A FEW OF THE MANY
FORMAX
PRODUCTS



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CONTACT WHEELS
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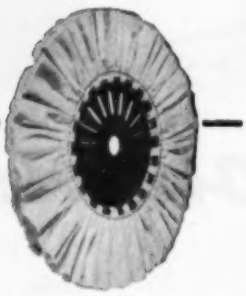
A C-20 flexible Contact Wheel will form itself to the shape of the work and permit the abrasive belt to polish contoured surfaces and F-26 Abrasive Belt Lubricant will increase belt life by preventing loading and glazing. Produces finer, smoother and brighter surfaces through lubrication.



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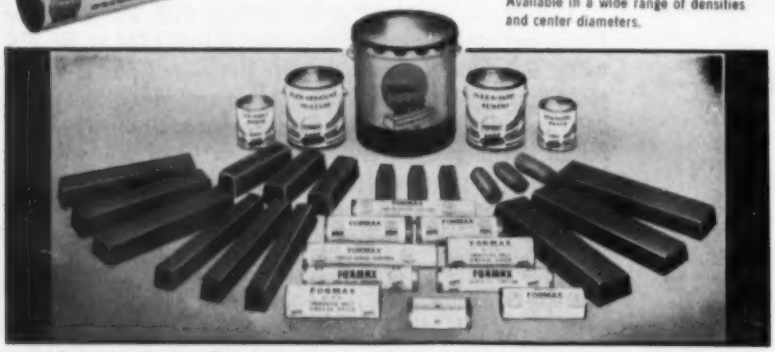
These famous long-wearing buffs run cool under all buffing conditions. Constructed of high count bias-cut cloth or sisal mounted on safe steel centers. Available in a wide range of densities and center diameters.



A complete line of buffing compounds in bar form as well as in liquid form for brush or spray application. Also Flex-A-Glu polishing wheel cements.

Our Laboratory and Sales Engineering staff would welcome the opportunity to be of help in solving your finishing problems.

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CHEMIST

Several years experience in research and development of electroplating processes; also testing of road and building materials and organic compounds. Supervised laboratory and analytical control sections. Available on short notice. *Reply to:*

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New Trade Mark Adopted. In order to avoid any possible confusion between their products and those of others, Tumbling Sales & Service Company, King St., Greenwich, Conn., have discontinued the use of the name TESCO. Effective immediately, the trade-mark, ESBEC will apply to their Esbec Tumbling Division in Meriden, Conn., and to a variety of equipment and supplies which will be marketed under their name.

Currier Purchases "Dee Tee". Currier Company, Inc., announces the purchase from Vokar Corporation of Dexter, Mich., of their "Dee Tee" cleaner business in its entirety. This equipment is used for vapor degreasing automobile differentials and transmissions. Production is scheduled to start in Oakland soon after June 1.

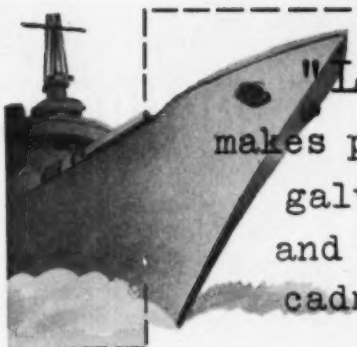
Instrument Firm Opens Plant in New Jersey. Transfer of its New York offices to a new 20,000 square foot plant in Mountainside, N. J., by Beckman Instruments, Inc., is under way.

The air-conditioned brick structure, tripling the size of Beckman's current east coast operation, is located on U. S. Highway 22 to New York, just 12 minutes from Newark Airport.

Functioning as northeast sales and service headquarters for the South Pasadena, Calif., parent company, this building also will provide a branch manufacturing facility for the Beckman Helipot division, maker of helical potentiometers.

Free Course in Electroplating. The Fall term in Electroplating at the Brooklyn Evening Technical High School, 29 Fort Greene Place, Brooklyn 17, N. Y., begins September 16, 1953. Laboratory experiments include analyses of copper, nickel, chromium and silver baths. Additional laboratory work provides the opportunity to perform Hull Cell experiments, *p*H meter operation, thickness measurement by chemical methods of zinc, cadmium, nickel, chromium. Classroom discussion covers such topics as a review of the fundamentals of elementary chemistry, tank area calculations, specific gravity and Baumé readings, wetting agents, brighteners, buffer agents, pitting. Registration begins September 14, 1953 and daily thereafter from 7:00 to 9:00 P. M. Classes meet Tuesday and Thursday nights, 6:45 to 8:15 P. M., plus about 6 Friday nights during the term. The term begins September 16, 1953 and ends January 29, 1954. Ask for Mr. L. Serota in room BW17 or 3E12.

Seventy-fifth Birthday—Barnstead Still & Sterilizer Company. Nineteen fifty-three is a double anniversary year for Barnstead Still & Sterilizer Company, Boston, Mass. As Barnstead completes 75 years of uninterrupted production, Dr.



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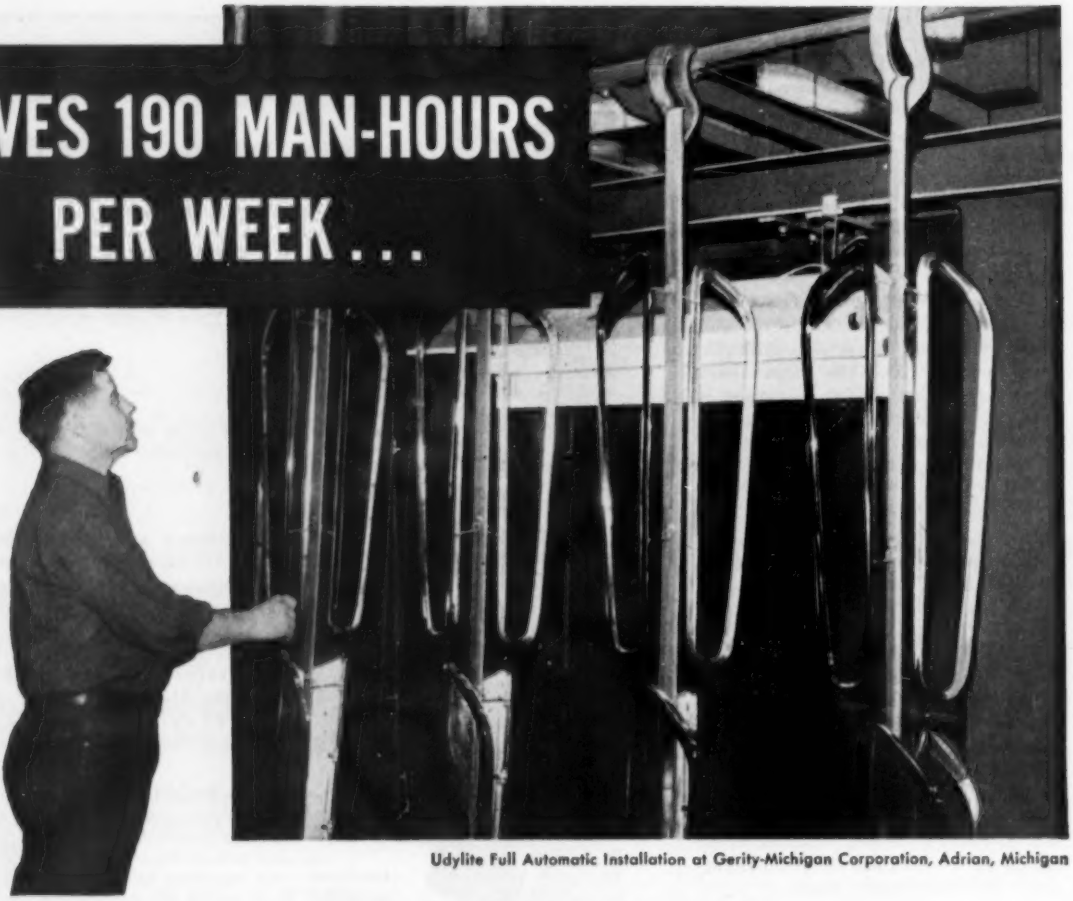

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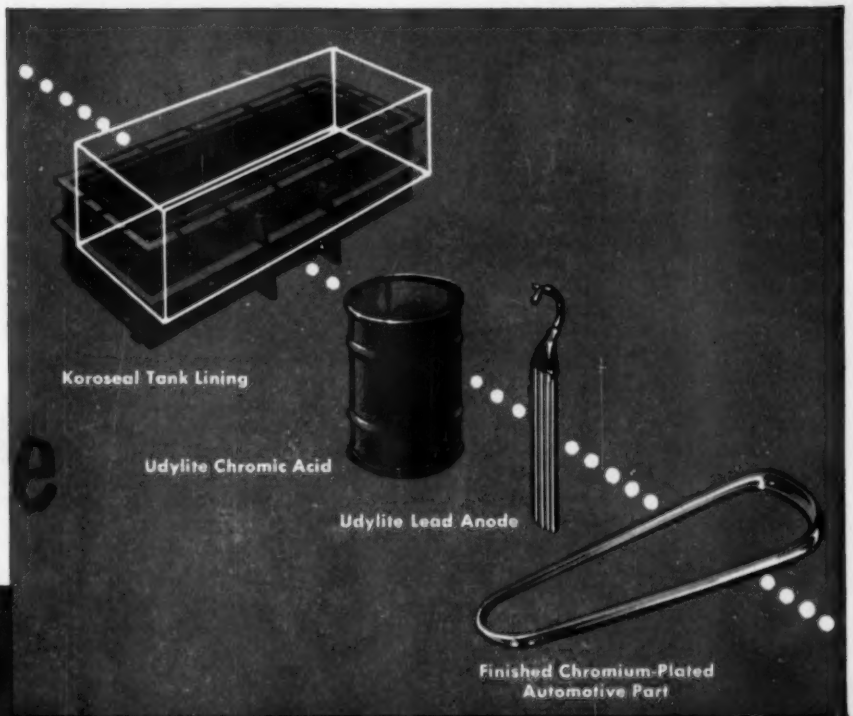
While chromium plating automotive parts on a two-shift basis, Gerity-Michigan Corporation showed direct labor savings of as much as 190 man hours per week using Udylite full automatic equipment.

But that's not all! They have effected substantial cost savings through smoother flow of materials, reduction in nickel buff, better and more uniform plate and lower scrap losses.

Why don't you investigate full automatic plating the Udylite Way. See how your Company, too, can profit by lowered costs . . . savings in manpower. Contact your Udylite Technical Man or write today to THE UDYLITE CORPORATION, DETROIT 11, MICHIGAN. *West of Rockies, L. H. Butcher Company, Los Angeles, California.*

PIONEER OF A BETTER WAY IN PLATING

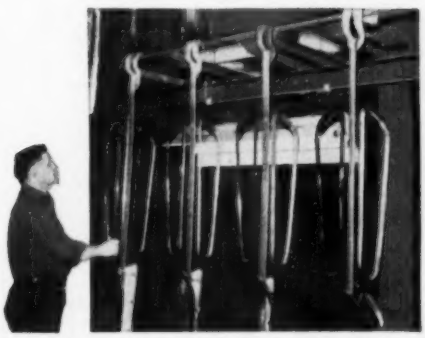
THE *Udylite* CORPORATION
DETROIT 11, MICHIGAN



Udylite

Supplies . . .
Assure a good start toward a perfect finish!

Here's automotive parts at Gerity-Michigan Corporation on their way to a perfect finish—thanks to Udylite automatic plating equipment.



In chromium plating . . . supplies are as vital as the process! That's why it pays to get Udylite.

Koroseal Tank Linings resist nearly all acids—particularly chromic . . . and they will not contaminate solutions. They do not oxidize or plate up, and are unaffected by oil or grease.

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Udylite Chromic Acid undergoes rigid quality control methods . . . to assure you uniformity regardless of the quantity you need.

Udylite Sulphuric Acid—66°—well stocked for prompt delivery.

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PIONEER OF A BETTER WAY IN PLATING

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

Industry News

Alonzo J. Shadman, President of the firm, celebrates his 75th birthday, too. The firm began in 1878, by filling the needs of a Boston physician for a steady supply of pure distilled water. Today, Barnstead produces hospital sterilizers and autoclaves, water baths for laboratory work, and storage tanks of metal and pyrex for distilled and demineralized water—and stills and demineralizers ranging in capacity from ½ gallon to 1,000 gallons per hour.

Full Color Sound Film. "Steel with a Thousand Qualities", a 37 minute, 16 mm full color sound film by Lebanon Steel Foundry, Lebanon, Pa., tells the story of steel castings from design to final inspection and actual applications. This film, in brilliant color, is carefully narrated, and shows in actual operation blazing electric furnaces, charging, tapping and pouring of the white-hot molten metal, pattern making, heat treating, and the spectacular centrifugal casting of stainless steel components of jet aircraft engines. Several animations illustrate what actually occurs when intergranular corrosion takes place, and how it is overcome through proper heat treatment. So dramatic and factual is the film that it has been selected by Mutual Security Agency for showing to industrial and engineering groups in nations abroad.

Plating Waste Treatment. Economic aspects for the recovery of scarce metals and a discussion of a new process for the recovery of scarce metals and a discussion of a new process for the recovery of cyanide from cyanide plating rinse baths were explained in a paper delivered by C. F. Paulson, The Permutit Company, New York, N. Y., before the Purdue Industrial Waste Conference at Purdue University. He described a new method utilizing demineralization which simplifies considerably the waste disposal problem associated with plating rinse waters and also reduces investment, space, and operating cost.

New York Area Distribution for Schaffner. Schaffner Manufacturing Company, Inc., Pittsburgh, Pa., have announced the appointment of the Frederick Gumm Chemical Company, Kearny, N. J., as their representative in the metropolitan New York area.

Production Facilities Enlarged. The Atlas Mineral Products Company, Mertztown, Pa., announces the enlargement of its production facilities for Plastaloy reinforced polyester fume exhaust systems. The increased demand for economical plastic fume exhaust systems has required an increase in production facilities of Plastaloy which was introduced two years ago by Atlas.

Aluminum Coated Steel. Light Metal Processors, Inc., Redwood City, Calif., formerly of Chicago, a large anodizing corporation, will construct a new quarter million dollar plant to begin operations immediately to produce an aluminum clad steel.

The process, known as Mollerizing, is widely used in Sweden for the coating of steel with aluminum to prevent rust or corrosion. It has wide application in the industrial field where rust protection is required. The introduction of the process will mark the start of a brand-new industry in California.

New Copper Mine. One of the most completely mechanized copper mines in the world is under development in what is now a wilderness in Northwest Michigan. The mine, to be known as the White Pine Mine, is scheduled to go into operation late in 1954, and will produce copper at the rate of about 75 million pounds a year. A new town with a population of about 2,000 will be built around the mine.

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Tanks provide for anode rods below solution level and plating cylinders fully immersed.

For continuous rotation of cylinder from one operation to another and where minimum of solution drag-out is important. Overall length of tank is reduced since drives on tanks are eliminated. Overhead motor drive shown is gearhead totally enclosed. Roller bearing chain drive to absorb load shock.

* Pat. Pend.

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STORTSWELDED fabrication is your best assurance of complete satisfaction and long, trouble-free service life. Storts engineers can help you to design so as to provide structural strength, corrosion resistance and adaptability to special production requirements. When buying tanks for plating or other processing service, remember that real economy is determined by the lowest cost per year of tank life. Let Storts show you how to save more on maintenance.

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Society News

N. A. M. F.

Northwest platers, at a meeting held in Seattle, Wash., agreed to form a branch of the NAMF and to continue to hold regular meetings to discuss local and national problems. The Northwest Branch will cover the cities of Seattle and Tacoma, Wash., and Portland, Ore.

Approval to form another local branch of the NAMF was expressed by platers attending a dinner meeting held in Cincinnati, Ohio. Curtis Varland of Varland Metal Service, Inc., of Cincinnati, was elected as Chairman of the local group.

New A. S. T. M. Officers

Official notice of the election of new officers of the American Society for Testing Materials for the ensuing year was given at the 56th Annual Meeting of the group in Atlantic City.

President for a term of one year is Leslie C. Beard, Jr., Socony-Vacuum Oil Company, Inc., New York 4, N. Y. Vice-President for a term of two years is Claire H. Fellows, The Detroit Edison Company, Detroit 26, Mich. Elected to the Board of Directors for three-year terms are: Neil A. Fowler, General Box Company, Des Plaines, Ill.; Richard T. Kropf, Industrial Thread Division, Belding Heminway Corticelli, New York 18, N. Y.; Theodore E. Olt, Armco Steel Corporation, Middletown, Ohio; John R. Townsend, Sandia Corporation, Albuquerque, N. M.; and Kenneth B. Woods, Professor of Highway Engineering, Purdue University, Lafayette, Ind.

Electrochemical Society

The 104th meeting of the Society will be held at Wrightsville Beach, N. C., on September 13–16, 1953 and will feature Sessions on Corrosion, Electrodeposition, and Batteries.

Opportunities will be offered interested parties to inspect some of the International Nickel Company's marine-exposure facilities in the neighborhood. Mr. Frank LaQue is also planning an interesting marine exhibition of corroded samples.

Society of Industrial Packaging and Materials Handling Engineers

The Mechanical Engineering Department of the Massachusetts Institute of Technology will present the 1953 Industrial Packaging and Materials Handling technical short course educational program next October in Boston, according to an announcement by SIPMHE, who will sponsor the course as part of their annual meeting.

The four-day short course will begin Monday, October 19, while the exposition will open the following day.

Personals

A. J. Frieling and **M. L. Lloyd** have become managers of Wyandotte Chemicals' Boston and Dallas District offices. Frieling, a native of Grand Rapids, Mich., has many years of sales and administrative experience in the Detroit area. He

Frieling **Lloyd**

served Wyandotte Chemicals in Dayton, Ohio, before his transfer to a special home office assignment. Lloyd, a native of Pennsylvania, has several years of merchandising experience in Baltimore, and since 1949 has been a resident Wyandotte representative in Roanoke, Va.

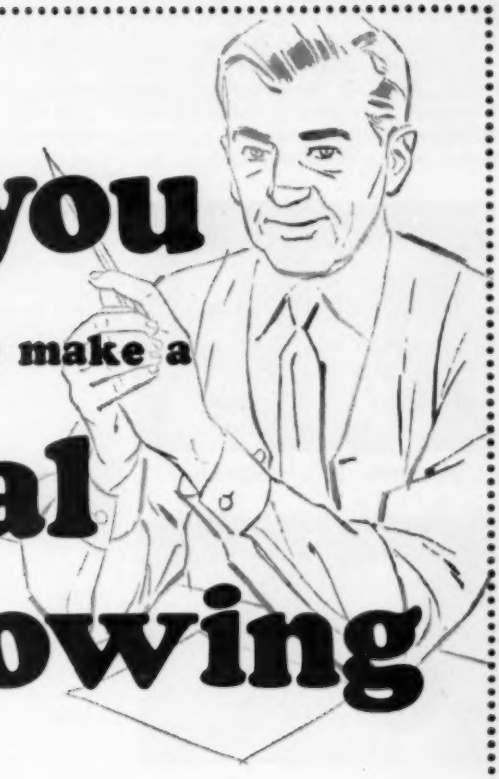
Arthur M. Brewer has rejoined the engineering staff of Automotive Rubber Co., Inc., Detroit 4, Mich. Art first joined Automotive Rubber Co., Inc., at the

Brewer

close of World War II. A graduate engineer, he spent two years as an ARco sales engineer, working extensively in the electroplating field. Brewer, being a member of the Michigan Air National Guard, was then recalled to active duty and served 27 months as a jet pilot-instructor until his recent release.

William F. Ross has been named sales representative by the J. E. Von Maur Company of Columbus, Ohio to handle expanded sales activities of Metalwash Machinery Corporation, Elizabeth, N. J., in the Ohio, Eastern Indiana and Kentucky territory.

Ross, formerly sales engineer, designer and erection engineer with The Electric Furnace Company, has a wide and varied experience in the heat-treating and metal working industries.



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real showing

in your

plating

Ask **MEAKER**

With over fifty years' experience manufacturing automatic plating machines custom built for highest production at lowest unit cost for some of the largest plating departments, MEAKER has the know-how to help you make a real showing in your plating. For the complete story, ask The Meaker Company, 1639 So. 55th Ave., Chicago 50, Ill.

MEAKER PRODUCTS

Full Automatic and Semi-Automatic Electroplating Equipment
Strip Steel Plating Equipment • Wire Galvanizing Equipment
Pickling Machines • Process Conveyors
Motor Generators and Rectifiers

Special Machines for the Unusual Requirements

4485

Hubert M. Goldman has been appointed to the newly created post of Assistant to the Sales Manager and Technical Engineer; **Francis A. Schneiders** to the position of Technical Service Manager; and **Lawrence J. Durney, Jr.,** and **Edward F. Foley** as Research Chemists in the enlarged research facilities of Enthone, Inc.

Goldman

Schneiders

Durney

Foley

Goldman has been associated with Enthone, Inc., for over six years as a Chemical Service Engineer and Technical Service Manager. He is Past President of the Bridgeport Branch, A. E. S. and a member of the American Chemical Society, Electrochemical Society, and Alpha Chi Sigma.

"Frank" Schneiders, a graduate Chemical Engineer from Lehigh University, has been with the company for three years in the Research and Service Engineering Laboratories. He is a member of the New Haven Branch, A. E. S., American Chemical Society, and Tau Beta Pi, honorary engineering society.

Larry Durney joins the research staff after having worked as Plant Finishing Engineer for Sargent & Company of New Haven for the past six years. Active in the metal finishing field since his graduation from Manhattan College in 1942, he is well known in the New England area. His background includes employment as Chief Chemist at Contract Plating Company, Stratford, Conn., and at Sulphur Products Company; and as Plating Foreman and Plant Chemist for The Propeller Division of Remington Rand Corporation. He is presently Vice-President of the New Haven Branch, A. E. S. and a member of the American Chemical Society.

Edward Foley was appointed to the research staff after having completed 1½ years of service as Research Assistant to Dr. Henry B. Linford of Columbia University, New York City. He holds a B.S. degree from Columbia and is an active member of the Newark Branch, A. E. S. and the Metropolitan section of The Electrochemical Society. While in the employ of Columbia University, Ed assisted Dr. Linford in his work on electroplating and similar operations.

James Gerity, Jr., President of Gerity-Michigan Corporation, plating and finishing company, Adrian, Mich., has been elected a member of the board of directors of Schultz Die Casting Company, Toledo, Ohio. He is one of the founders of Schultz Die Casting, which was incorporated in 1930, and has been secretary of the company since its organization. Mr. Gerity's election to the board marks a resumption of his directorship of Schultz Die Casting, a position he relinquished in 1951.

J. F. Carland has been elected Executive Vice-President and General Manager of the Chandeysson Electric Company, St. Louis, Mo. Formerly of Chicago and a graduate electrical engineer, Carland spent twenty-three years with the General Electric Company in the manufacturing, engineering, financial and marketing departments of two operating divisions. Other officers elected were: **T. A. Leonhardt,**

Carland

Bundschuh

Vice-President and Plant Superintendent, and **William E. Schwarz,** Vice-President and Engineering and Plant Manager. Mr. Leonhardt has been associated with the Company for 30 years in several management capacities and Mr. Schwarz, formerly Chief Engineer, rejoined the Company and brings valued experience from his work with Westinghouse Electric & Manufacturing Company and E. I. duPont. **Dolores Bundschuh,** Treasurer and Office Manager, and **K. H. Eggers,** Secretary, were also re-elected officers.

Harold M. Winton, training director for the mechanical goods division, United States Rubber Company, has been named to the newly created post of sales development manager. He has been associated with U. S. Rubber since 1946 when he joined the sales training department of the tire division. In 1950, he was appointed director of personnel and training for the mechanical goods division, where he became responsible for development programs for training in sales and production.

Clarence B. Jones has become secretary and general attorney of The Diversey Corporation, and **O. E. Soderberg,** formerly the secretary and administrative vice-president, was elected to the post of treasurer, a position vacated in November by the death of **C. E. Glassner.** Soderberg was re-elected administrative vice-president.

Jones

Soderberg

Jones was with Standard Milling Company six years as secretary and attorney prior to joining Diversey and before that he was attorney for Columbia Steel Company. Jones holds a B.A. degree from Yale University and a law degree (J.D.) from Northwestern University.

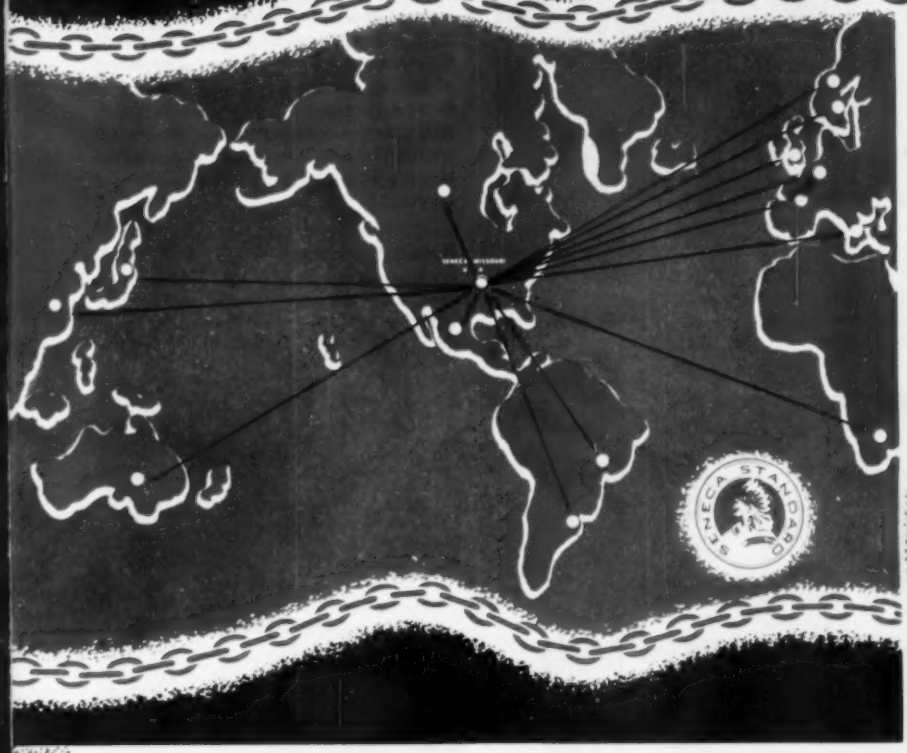
Lou R. Gallas has been named Sales Engineer by Electro-Glo Company, Chicago. He will represent the company nationally on both electropolishing processes and installations and will headquarter in Chicago. Gallas was formerly associated with Promat Division of Poor & Company and Tincher Products Company, Division of Ideal Industries.

John R. Freeman, Jr., has been appointed vice-president of metallurgy and research of The American Brass Company. A native of Winchester, Mass., Freeman graduated from Massachusetts Institute of Technology in 1916, following which he served for 15 years in the National Bureau of Standards, Division of Metallurgy as assistant chief of the division from 1928 to 1930. In that year he joined the technical department of The American Brass Company, and in 1934 was named assistant manager of the department. In 1938 he was made technical manager of the company.

A. E. (Ed) Smith and **Harvey Blizzard** have been appointed sales engineers by J. J. Siefen Company. Smith, who will handle Siefen accounts in Indiana, lives at R. R. No. 2, Box 10, Elwood, Ind.

J.C. MILLER COMPANY

World's largest producers of *TRIPOLI BUFFING COMPOUNDS* . . . scientifically controlled from mines to finished product



SOURCE and MODERN PRODUCTION

Combine to supply you with the world's finest, most widely used line of buffing compounds

J. C. Miller Company

Due to the increased demand for both bar and liquid buffing compounds, the J. C. Miller Company has just completed new facilities for unlimited production. Now more and more manufacturers everywhere can be assured of receiving prompt delivery on their compound requirements; technical assistance and data from one of the nation's most completely equipped and staffed laboratories.

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LIQUIMATIC . . .

THE Liquid Buffing Compound

J. C. Miller Engineers are fully qualified through technical training and years of practical experience to demonstrate and recommend materials and methods for use in your plant — materials and methods that pay you big dividends in higher production and increased savings.

Our Buffing Engineers are equipped with portable Liquimatic demonstration kits which enable them to easily show you the savings that Liquimatic can effect in your plant — on your production line. This demonstration equipment is rapidly set up, requires no assistance from your help and the test can be made on hand lathes or automatic equipment using just a compressed air connection. The demonstration in no way impedes your normal production flow.

Here is a demonstration you should see regardless of past experience or whether or not you are using a liquid compound at present! We know that we can show you that we have achieved the maximum in performance through combining the very latest in equipment with the very best in compounds — Liquimatic. *This is the Liquimatic team — an unbeatable combination.*

Users of Tripoli powder the world over obtain their supply from the American Tripoli Corporation in Seneca, Missouri, where the only known deposit of this unusual material is located. A few of it's many users include manufacturers of buffing compositions, lacquer finishing compounds, automobile polishes, insecticides, etc. Perhaps you have a place for Seneca Standard Tripoli in your process. *Investigate its possibilities!*

EXTRUDED BAR COMPOUND

The J. C. Miller Company offers a complete range of all sizes and shapes of extruded tripoli bar compound. These extruded bars meet all the requirements and conditions of any job — large or small. Write for complete details.

"Seneca Standard" Tripoli is processed in Seneca, Missouri, U. S. A., and is used in all the leading industrial countries of the world.

AMERICAN TRIPOLI CORPORATION
SENECA, MISSOURI, U. S. A.

A Subsidiary of

Tripoli • Stainless steel compound • Lime finish • Cut and color • Chrome rouge • Greaseless • Grease stick • Emery cake • Burring compounds

Controlled Compounds for all Finishing Requirements

J. C. MILLER COMPANY — Grand Rapids, Michigan

Personals

Blizzard will cover the territory of eastern Detroit, Michigan and northwestern sections of Ohio and will locate at the home office, 5657 Lauderdale, Detroit 9, Mich.

J. D. Kershaw has been announced as the new district sales manager for Ohio by the Hanson-Van Winkle-Munning Company, Matawan, N. J. His headquarters will be in Cleveland, 308 Engineers Bldg. Kershaw moves from Grand Rapids where he served as H-VW-M sales representative for eight years. Before joining H-VW-M in 1945, he spent four years with Studebaker Corporation, South Bend, Ind., where he was supervisor of plating in the aviation division. He is a member of the A. E. S. and a graduate of Illinois Institute of Technology, B.S. in Chemistry.

Kershaw

Martin

The appointment of **R. K. Martin** as sales representative for Western Michigan was also announced recently. His field office will be at Grand Rapids with headquarters in Detroit. Martin comes to H-VW-M from Merchants Chemical Company, Inc., where he was an industrial sales representative for the past 3½ years. He has worked with Allison Division of General Motors as a test engineer, chemist and plating analyst; with Wright-Patterson Airforce Base as a chemist in the research and development department of the electrochemical section; and with Wyandotte Chemicals, Inc., as an industrial service representative. Martin attended Wabash College, and took advance training in chemistry at the University of Dayton.

Robert L. Reeves was elected Vice-President in charge of sales, J. B. Ford Division, of Wyandotte Chemicals Corporation, according to a recent announcement. Reeves, 43, has been General Manager of

Reeves

Sales for the Ford Division since joining Wyandotte in January, 1950. Born in Pennsylvania, he was reared in Georgia and completed his education at Georgia Tech in Atlanta. He came to Wyandotte from the B. F. Goodrich Company, Akron, Ohio, where he had charge of retail merchandising for B. F. Goodrich throughout the nation.

Dick Loupee has been appointed sales representative in the St. Louis and South-

Loupee

ern Illinois district by the Davies Company's St. Louis office.

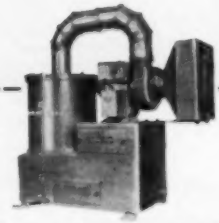
Edward T. Day has been named manager of branch sales for mechanical goods division, United States Rubber Company.

Appointed at the same time was **Matthew J. Delehaunty,** who becomes manager of industrial sales. Both men will be headquartered in the company's New York offices.

Day has been affiliated with the sales department of the mechanical goods divi-

Why it pays to SPIN-DRY plated work— small lacquered parts

Choose from 3 carefully engineered models . . .



1. **Standard Model.** Takes nearly every type of part. Built for long, trouble-free service.

Saves time . . . With the New Holland Kreider Dryer operating at 625 r.p.m. on only ¾ h.p. you can *spin-dry* a basket of parts (1140 cu. ins.) in as little as 35 seconds—no more than 2 minutes.

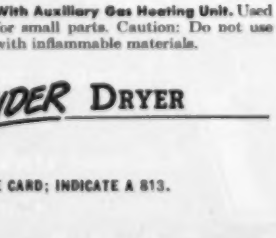
Improves quality . . . With a New Holland Kreider Dryer, high speed centrifugal spin-drying eliminates scarring and marring, assures smooth evenly dried surfaces, with longer lasting luster . . . fewer "rejects."

Cuts costs . . . What's more, though a New Holland Kreider Dryer occupies less than 6 sq. ft. of floor space, it's a big money saver. Power costs are low, production high—with little or no maintenance over years. And one man can operate it, easily, efficiently.

See for yourself. Write Department PL-73 today for illustrated 4-page folder . . . also addresses of installations near you.

New Holland Machine Co., New Holland, Pa.

2. **With Auxiliary Steam Heating Unit.** Used for small parts that hold moisture—lacquered parts—or where cold water rinse is used.



3. **With Auxiliary Gas Heating Unit.** Used for small parts. Caution: Do not use with inflammable materials.

NEW HOLLAND KREIDER DRYER

sion since he joined U. S. Rubber in 1934. Successively with the Salt Lake, Chicago, and Los Angeles offices, he has been in New York since January, 1952. He is a graduate of the University of Utah, and a native of Salt Lake City.

Delehaunty, former sales manager for the Pittsburgh branch of mechanical goods, has been associated with the rubber business since 1911. He became a division salesman in 1937, and was named Pittsburgh branch manager in 1949. His successor in Pittsburgh will be **H. A. Lundberg**, now a salesman at that branch.

Carl T. Dowling has been named New Jersey representative for Bart-Messing Corporation. In his new position, Dow-

Dowling

ling will handle sales of selenium rectifiers, plating and polishing equipment and supplies, and precious metal plating salts and solutions, including bright gold and bright rhodium.

Prior to his present connection he was associated with Hanson-Van Winkle-Munning. He has been engaged in sales and engineering work in the electroplating field for the past eight years.

John E. Manning has been appointed Western District Manager for Promat Division, Poor & Company, Waukegan,

Manning

Ill. He was formerly employed by the Sundmark Supply Company, Los Angeles, and the Wolverine Brass Works, Grand Rapids, Mich., as a process engineer. Manning received his degree in Chemical Engineering from Michigan State College.

James E. Ferris has been named director of sales and **M. F. McCombs** as manager, Chlor-Alkali sales by the Niagara Alkali Company. Both positions are newly created.

Ferris, who is past president of the Salesmen's Association of the American Chemical Industry, joined the company in 1926, and has been in sales since 1931. He is on the board of directors of the Compressed Gas Association and the board of governors of the Chemical Specialties Manufacturer's Association. McCombs came to the company in 1921, and has been in sales since 1923.

Guy A. Cummings has been appointed to the newly created position of Assistant Sales Manager by Frederic B. Stevens, Inc., Detroit. Cummings will direct sales activities for all Stevens automatic plating and processing equipment.

Cummings has been employed as a Sales Engineer at Stevens for seven years. Prior to joining Stevens he was employed in the Sales Department of the Sperry

Cummings

Gyroscope Company. He is a graduate of Worcester Polytechnic Institute, Worcester, Mass. At present he is an active member of the Detroit Branch, A. E. S., and the Engineering Society of Detroit.

MOBILCRANE
lifts and moves
work anywhere
without
transferring
load
Don't limit plating production by costly hoists that are awkward to manage or rearrange. Use the versatile and easily maneuvered MOBILCRANE.
It can be moved anywhere with full load, from cleaning to finishing, at a minimum cost. Moves easily through doors, narrow aisles and into corners. Stacks heavy fixtures, drums, plating barrels, wherever convenient. Make the best use of your floor space. Install MOBILCRANE.
LEMPCO
½ TON — 1 TON — 2 TON
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For 35 years a leading builder of machine tools
for quick action use coupon
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Gentlemen: Kindly send details on the MOBILCRANE.
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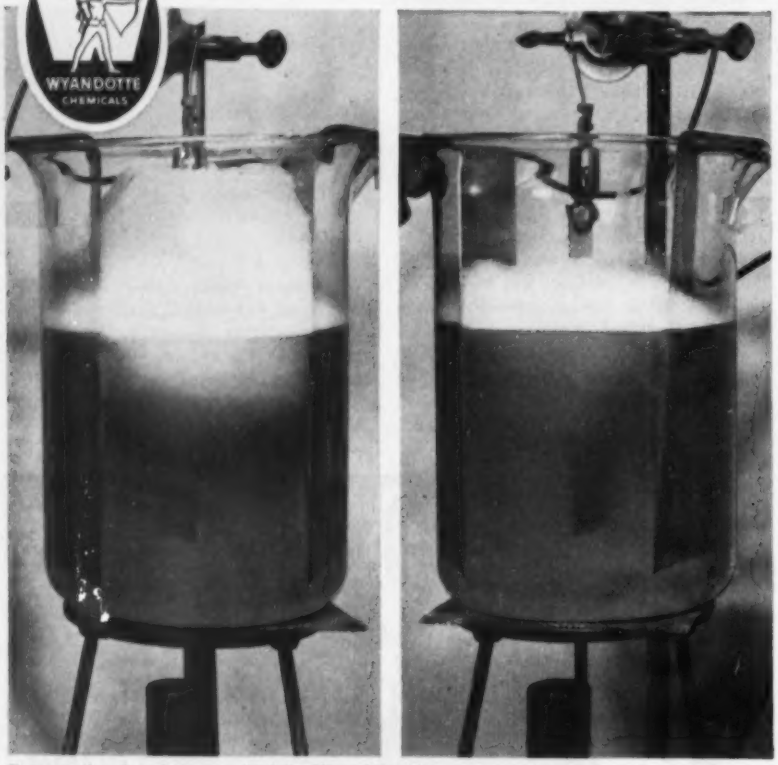
Specialists in Industrial Cleaning Products



Comparative foaming test. At left, Wyandotte F.S., prior to latest formula improvement, has average foaming characteristics for a heavy-duty electrocleaner used at a high current density. At right, in the same test at the same high current density, foaming of improved F.S. is greatly reduced. This minimizes explosion possibilities in high-conductivity electrocleaners, as well as problems due to excessive foam carried out on parts.

Improved Wyandotte electrocleaners are non-dusty and cut foam formation 50%!

Now Wyandotte's three great electrocleaners, F.S., B.N. and No. 90 are even better than ever!

Excellent performance characteristics of all three are unchanged! Dustlessness minimizes coughing, sneezing, skin irritation — foam is reduced as much as 50%!

For better electrocleaning at lower cost, use the best electrocleaners on the market: F.S.* for all around heavy-duty anodic steel cleaning: B.N. for versatile direct and/or reverse cleaning of non-ferrous metals; No. 90 for anodic steel cleaning where smuts and/or chrome contamination are particularly troublesome.

Ask your Wyandotte metal cleaning specialist to demonstrate improved F.S., B.N. or No. 90 to you. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Angeles 12, California.* * Reg. U.S. Pat. Off.

CLEANING THE WORLD

Largest manufacturers of specialized cleaning products for business and industry

Wyandotte CHEMICALS

Helpful service representatives in 138 cities in the United States and Canada

Donald M. Anderson, of Attleboro Falls, Mass., has been named New England representative for Bart-Messing Corporation, and Sel-Rex Precious Metals, Inc.,

Anderson

of Belleville, N. J. Prior to joining the Bart-Messing and Sel-Rex organizations, Anderson was employed as Boston-Attleboro representative for Baker Bros., Inc. In his new capacity he will handle sales of selenium rectifiers, plating and polishing equipment and supplies, and precious metal plating salts and solutions.

Robert Feigin has been engaged as technical director of Globe Compound Company, Inc., Wolcott, Conn. Feigin was formerly chief chemist in charge of application research, technical service and formulation at the Alrose Chemical Company, Providence, R. I.

Henry Kashman has been named sales engineer by G. S. Blakeslee & Co. Kashman will handle the Company's New York City and Long Island territory and will operate out of the Company's New York office. His background involves considerable technical and sales experience. **Wilbur (Bill) Thiess** was appointed at the same time to a similar post in the territory consisting of the southern half of Ohio and portions of Kentucky and West Virginia. Bill brings to Blakeslee a wealth of experience and is well known and well respected in the trade.

Obituary

✠ **Stewart A. Millar,** new products development engineer for the Detrex Corporation of Detroit, major manufacturer of industrial cleaning equipment and chemicals, passed away recently at the age of 27. Death was attributed to complications following a kidney ailment. Regarded as one of the most brilliant members of the Detrex engineering staff, young Millar was a key man in the development of ultrasonic metal cleaning equipment, recently announced by the company.

Born in Newark, N. J., and raised in Nutley, N. J., Millar received his B.S. in chemical engineering from the University of Detroit and was awarded his master's degree by the University of Michigan.

Trade Literature

L—700. Electric Immersion Heater Catalog—A new catalog that features a section of application data for calculating the power requirements for heating processing tanks has been prepared by the Cleveland Process Company, 7016 Euclid Ave., Cleveland 3, Ohio. The data simplify the problem of estimating heat losses, determining the correct KW needed and selecting proper heater size for tank capacity. With these factors accurately determined, it is an easy matter to establish the most efficient and economical immersion heater installations. Fully described in the new catalog are two types of electric immersion heaters manufactured by the company. A copy of the Clepco-Glorod Immersion Heater Catalog with power calculating data may be had by using Reader Service Card.

L—701. New Bulletin on Metal Cleaners—As a new addition to the series of bulletins on their finishing products, Apothecaries Hall Company of Waterbury, Conn., has just issued Bulletin B-8 entitled, Ahcoloid Metal Cleaners. This bulletin contains information about their complete line of cleaners for soak tanks, electrolytic cleaning, power washers, and tumbling barrels. Copies of the new bulletin are available on request. Use Reader Service Card.

L—702. High Corrosion Resistance Gives Nickel Plated Metals Wide Range of Uses—A reprint of 4 pages by The International Nickel Company, Inc. It discusses how to prevent product contamination and minimize equipment maintenance by using nickel plating where economics do not justify use of solid alloy or clad metal. Successful applications in the chemical, food, petroleum and other process industries are cited which used deposits of .008 inch to .085 inch of nickel. For your copy use Reader Service Card.

L—703. Tumbling Equipment Catalog Sheets—The latest additions to the Esbec line of tumbling equipment are described in newly released catalog pages of The Tumbling Sales & Service Company, Greenwich, Conn.

Among the equipment outlined is the Esbec twin bench tumbling barrel, an ideal one for high production tumbling of all types of small pieces, from electronic parts and surgical needles to washers, screw machine products and other parts.

A self-contained, watertight tumbling bench is available for the Esbec twin. This unit provides built-in separating

LOW COST
IRIDITE®
FINISHES
for zinc, cadmium, aluminum and cuprous metals
provide
corrosion resistance
paint base
choice of appearance
And they are easy to apply! Just a simple chemical dip for only a few seconds produces the coating.
LOW MATERIAL AND SHIPPING COSTS
combine to make Iridite the most economical chromate finish you can buy. Many Iridite chemicals are packed in powder form, thus can be shipped to you in steel pails at freight savings of up to 75%! Pails take less storage space, are easier to handle, eliminate carboys, need not be returned.
WHY NOT TEST IRIDITE ON YOUR PRODUCTS? Write for literature and send samples for free test processing. See "Plating Supplies" in your classified telephone directory or write direct.
ALLIED RESEARCH PRODUCTS
INCORPORATED
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drawers and a water outlet which can be hooked up to any drain. For those plants where disposal of water is a problem, the Esbec tumbling bench is a truly practical answer. It is also a very practical piece of equipment for production tumbling departments. For your copy use Reader Service Card.

L—704. Plating Waste Equipment—The treatment of electroplating rinse waters in industrial plants through the use of ion exchangers has been one of the most attractive methods considered in recent years for the elimination of complex water pollution problems. One of the most successful applications of this process has been toward the recovery of chromic acid from electroplating solutions. Now, the process has been extended to the treatment of mixed chromate rinse waters, the recovery of cyanide from cyanide plating rinse baths, etc.

Valuable information on these newer applications is contained in Bulletin No. P-3865, an 8-page preprint of a paper, "Plating Waste Treatment", by C. F. Paulson, The Permutit Company, New York 36, N. Y.

Table, charts, cost and space comparison requirements and other data supplement the material which describes some of the forms in which industrially important metals can be economically recovered. For your copy use Reader Service Card.

L—705. Automatic Moisture Tester—Latest information on the new Beckman Aquameter, a high-speed electronic device which titrates for moisture automatically, has been compiled in an illustrated four-page folder. The brochure explains push-button moisture testing of such materials as paper, foodstuffs, petroleum products, alcohols, pharmaceuticals, ethers, animal tissue, antibiotics and blood. Also described is the Aquameter's simple operation, which permits untrained technicians to run precise water analyses in one or two minutes.

Literature can be obtained from Beckman Instruments, Inc., South Pasadena 1, Calif., through requests for data file 307-72 or through use of Reader Service Card.

L—706. Process Heating Publication—A brand-new bi-monthly publication of technical data and tips on process heating is now being published by Jensen Specialties, Inc., Detroit Industrial oven manufacturer.

"Heat Lines by Jensen", is designed to help men engaged in production planning and maintenance—where process heating is a factor.

Typical installations at major U. S. manufacturing plants are featured in each issue. Special heating problems of these manufacturers—and how they were solved—are described and illustrated. Other factual reports and features—with pictures—round out the four-page publication. To receive the free publication regularly, use Reader Service Card.

L—707. Lightweight Materials Handling Equipment Catalog—A new catalog on lightweight materials handling equipment has recently been released by Tobey Manufacturing Corporation, El Segundo, Calif. The new catalog covers a complete line of materials handling trucks which are constructed entirely of aluminum and weigh from one-third to one-fourth as much as conventional wood or steel trucks. A-frames, tote boxes, work tables and stack racks are also included in the catalog. For your copy use Reader Service Card.

L—708. Germanium Diodes Bulletin—International Rectifier Corporation, 1521 E. Grand Ave., El Segundo, Calif., has issued Bulletin GD-1 which describes fully the characteristics and advantages of the new line of diodes now being produced by the company which is the first to produce a vacuum impregnated diode. As the largest manufacturer of selenium power rectifiers, International Rectifier Corporation is now in a position to produce germanium diodes in any quantities desired. For a copy of Bulletin GD-1 use Reader Service Card.

L—709. Booklet on Rust and Tarnish Removal—A booklet on rust and tarnish removal by means of their six tailored types of Rustclean has just been published by Octagon Process Inc., 15 Bank St., Staten Island 1, N. Y. It gives detailed instructions for the use of these new products by wipe-on, spray and hot and cold immersion methods. By following instructions it is possible to remove rust and tarnish, retard corrosion and promote paint adhesion in a single procedure. Heavy, immovable vertical and horizontal surfaces can be treated by use of a special tailored type of Rustclean.

All the Rustclean's are non-inflammable, non-toxic, non-corrosive and safe to handle. There are no obnoxious or corrosive fumes. Their action is very fast, varying from seconds to minutes depending on the heaviness of the deposits. For your copy of the new booklet, use Reader Service Card.

L—710. Polishing, Buffing and Coloring Compounds Data Bulletin—The Apley N. Austin Company, Pequabuck, Conn., has published data on polishing, buffing and coloring compounds both of the water dispersable and the saponifiable type. The data given include the code, description, and use of the bars as described from the point of view of the metal or alloy to be treated. There is also a cross-reference which gives the same data from the point of view of the metal or alloy to be treated. For your copy of the literature use Reader Service Card.

L—711. Precious Metal Plating Folder—The Auromet Corporation, 267-P Elizabeth St., New York 12, N. Y., manufacturers of precious metal salts and solutions, has recently compiled a folder which gives operating information on gold, platinum, palladium and rhodium solutions. It also discusses the alloy formation of gold baths. Along with this are three tables giving the economics of gold solutions and salts and rhodium solutions.

A general discussion on the preparation of work for plating and making up the baths is given. Copies of the folder may be obtained by using Reader Service Card.

L—712. Buffing Compositions Bulletin—The Globe Compound Company, Waterbury 12, Conn., announces that its new technical bulletin, T-4, describing buffing compositions and their applications is freely available. Particular attention is called to their No. 300 hand bar size and GY-63 automatic type yellow all-purpose water-dispersible buffing compositions. These compositions have a diversity of applications, including coloring of steel and cutting and coloring of aluminum, without requiring cleaning when lacquering is desired. For your copy of this new bulletin use Reader Service Card.

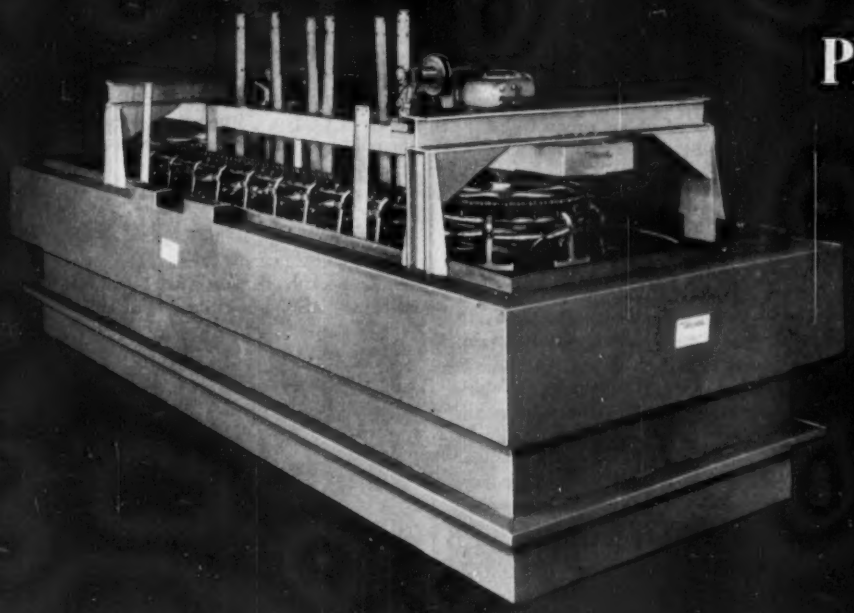
L—713. Ion Exchange in Hydrometallurgy—Valuable information is contained in a 16-page preprint of a talk "Ion Exchange in Hydrometallurgical Processes" by A. B. Mindler and C. F. Paulson of The Permutit Company, 330 W. 42nd St., New York 36, N. Y. The two main uses of ion exchange in the metals field, that of concentration of metal in dilute solution and separation of the components of mixtures of ions, are explained. Detailed information on limitations and possible applications of ion exchangers is also well documented. Tables, charts, flow diagrams, and other illustrations complete this informative piece of literature. For your copy of Bulletin No. P-3841 use Reader Service Card.

L—714. Publication Describes Gear-Motors—The function, design, and application of gear-motors are described in a new publication which has been announced as available from the General Electric Company, Schenectady 5, N. Y.

Designated as GEA-1437H, the 16-page, two-color information guide describes the standard types of gear-motors with ratings from 1/6 up to 200 hp. Cutaway photographs show the relative position of the parts which are distinctive to the design of each motor.

Adaptability to low-speed jobs and adjustable-speed drives are explained along with a description of gear-motor mainte-

A NEW WAGNER SEMI that grew out of A TOUGH PLATING PROBLEM



Here is a Wagner Semi-Automatic electroplating machine that adds a new high in plating versatility and efficiency of operation. It is provided with heavy duty battery clips for plating the insides of tubes or other hard to reach plating surfaces. This special semi-automatic system, made for a discriminating customer provides precise control of plate thickness on a specialized group of products with a minimum of attention. You too can benefit from the production know-how of Wagner engineers who constantly search for new and better ways to improve plating processes and equipment which result in lower costs, higher production and a minimum of maintenance.

BEFORE PURCHASING YOUR NEW PLATING SYSTEM . . . CHECK YOUR REQUIREMENTS AGAINST THESE WAGNER FEATURES

1 Simplicity of design and construction

2 Heavy duty battery clips provided for auxiliary contact

3 Anode bar equidistant from hooks, plating through entire cycle

4 Power unit and drive mechanism in one integrated package

5 Variable speed, controlled by one hand knob

6 Standard belt chain, replacements available everywhere

7 Standard fittings provided at all lubrication points

8 Agitating unit mounted on one bracket

9 Fully insulated at all strategic points

10 Double T work carriers shown on 12" centers, may be readily relocated on 16", 20", 24", etc.

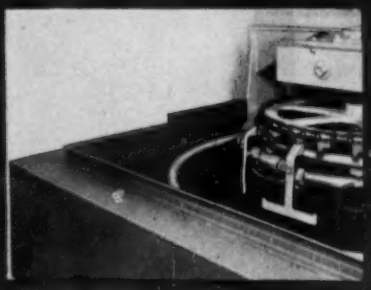
11 Completely bussed for easy installation

12 Adjustable draft control

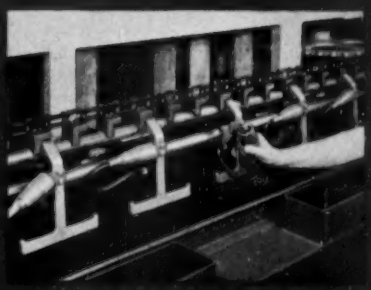
13 Drains for condensation

14 Central stack attachments

15 Micarta pusher blocks



Adjustable draft box hoods



Heavy duty battery clips

GREATER PRODUCTION WITH WAGNER SEMI-AUTOMATICS

Wagner Brothers build a complete line of plating equipment job-fitted to your specifications or plant set-up . . . and our modern research facilities and pilot plating plant contains exacting equipment for analyzing your present plating and finishing operations. For full particulars to meet your plating requirements, get in touch with the Wagner representative nearest you, or write direct to us stating your needs.

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☐ Send information on Wagner Semi-Automatics

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City _____ *Zone* ____ *State* _____

Trade Literature

nance. For your copy of this 16-page brochure use Reader Service Card.

L—715. Photoelectric Reflection Meter—A new edition of Bulletin 605 by Photovolt Corporation, 95 Madison Ave., New York 16, N. Y., lists for the first time a number of new accessories for use with a photoelectric reflection meter, Model 610 is designed for measuring the diffuse reflection of surfaces as an indication of color or degree of whiteness. It is widely used for tests on paints, ceramics and a great variety of other materials. This Bulletin No. 605 describes the Reflection Meter in a general way. A number of other bulletins are available which deal specifically with the application and Bulletin No. 677 in the paint and varnish industry. For your copy use Reader Service Card.

L—716. Bulletin On Blast Cleaning Hose Machines—Pangborn Corporation of Hagerstown, Md., has issued Bulletin No. 100A describing the blast cleaning hose machines which are produced for industry's hand-operated cleaning jobs.

This new 28-page bulletin points out that, in spite of spectacular advances in automatic equipment and airless blast cleaning, there are many jobs which can only be accomplished by the use of hand-operated nozzle blast cleaning equipment. The two fundamental methods of applying the abrasive, direct pressure and suction, are described as well as the applications of both wet and soft abrasives. Tables are printed which show the relationship between orifice area and circumference in nozzle sizes and air flow with required hp to develop air jets of varying diameters. For your copy use Reader Service Card.

L—717. Impervious Graphite Sectional Cascade Coolers—National Carbon Company, a Division of Union Carbide and Carbon Corporation, announces the publication of a catalog section covering the newly designed "Karbate" impervious graphite sectional cascade coolers, Series "CC".

The new design is fully described and their applications outlined. The three standard sizes are illustrated by dimensioned engineering drawings, and the features, common to all sizes, are explained: Type SN armored connections; radiused cross-overs between sections for high fluid velocities with minimum pressure drop; high cooling water capacity; redwood water guide strips with stainless steel clip springs; heavy base plate castings; and Teflon gaskets that eliminate gasket replacement and maintenance.

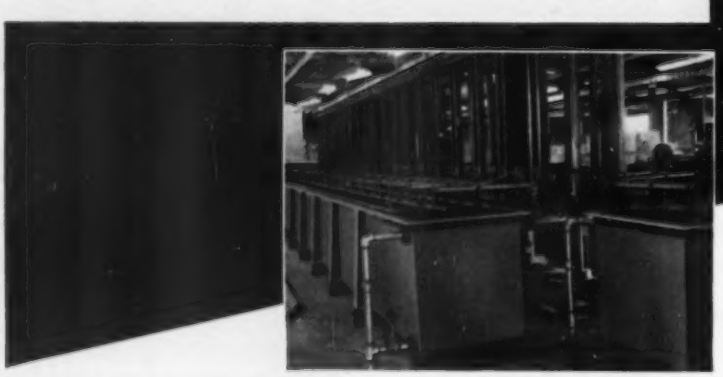
The catalog section also contains information to aid in the selection of "Karbate" impervious graphite sectional cascade coolers for the cooling of corrosive liquids and gases, complete tables of dimensions and specifications, as well as nomographs for determining cooling water requirements, overall heat transfer coefficients, and required cooling surface. For a copy of catalog section S-6820 use Reader Service Card.

L—718. Complete Casting Impregnation Story—The whole developmental and application story of modern impregnation of porous castings is available in a new 8-page, two color bulletin issued by the American Metaseal Manufacturing Corporation, 30 E. 60th St., New York City.

Complete illustrations show how the impregnation by a 100 per cent solid copolymer differs from older methods, and why only these new materials and methods can achieve complete impregnation. Photographs show the equipment used in batch immersion for the rapid treatment of large quantities of parts, as well as applications in various metals.

Special sections explain how impregnation reduces product rejects in both cast

LONGER LIFE—MORE PROTECTION



Manhattan Rubber Linings

For complete protection against contamination of plating solutions, and for tanks that will withstand heavy duty corrosive service, manufacturers specify "Manhattan Rubber Linings."

As a result of over half a century of experience in meeting the needs of equipment manufacturers, Manhattan has developed the most dependable and economical rubber linings in the industry today. Made of calendered sheets in required thickness of non-porous natural or synthetic rubber, these linings eliminate plating "risks" and give longer, better service. In some cases, Manhattan Rubber Lined Tanks have been reported in continual use for over 25 years.

To detect any imperfections which might allow acid to penetrate the rubber, Manhattan Lined Tanks are tested dielectrically under 15,000 volts. Made to withstand the severest conditions of use, Manhattan Rubber Linings are compounded with an exclusive inseparable rubber-to-metal bond.

Depend on Manhattan's experience and leadership in rubber engineering. Specify "Manhattan Rubber Linings" to meet your most rigid requirements.

RUBBER LINING PLANTS AT PASSAIC, N. J. AND NORTH CHARLESTON, S. C.

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose Fan Belts • Brake Linings & Blocks • Clutch Facings • Packings • Asbestos Textiles • Teflon Products • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

and metal powder parts. Tables are also provided giving the properties of the new impregnant, and the corrosives it will resist. For your copy of the bulletin use Reader Service Card.

L—719. Pump Bulletin—Bulletin No. G-1000 issued by Chempump Corporation, 1300 E. Mermaid Lane, Philadelphia 18, Pa., describes a new magnetically driven combined motor and centrifugal pump which requires no mechanical seals or stuffing boxes.

The 4-page bulletin contains valuable information covering application of the Chempump and its construction. Also included are dimension drawings, vacuum performance charts and performance curves for all models. For your copy use Reader Service Card.

L—720. Filter Data Sheets—The Ertel Engineering Corporation has published data sheets giving detailed engineering information on their positive seal multipurpose filters. One of the models described is the ECF which is specially designed for the filtration of costly solutions. This filter prevents by-passing of unfiltered liquids, allows use of various filter media, permits no losses due to leakage or evaporation and is quickly and easily cleaned. For your copy of these data sheets use Reader Service Card.

L—721. Barrel Finishing Manual—A new 16-page manual on barrel finishing processes has been announced by Minnesota Mining and Manufacturing Company, 900 Fauquier St., St. Paul, Minn.

One of the "Honite" barrel finishing method, a low pressure, random honing process for deburring and burnishing small metal parts, is discussed in detail in the illustrated booklet.

Included are sections on how to choose proper size "Honite" and "Super Honite" barrel finishing chips for specific operations, and selection of the correct barrel finishing compounds for each. Ten barrel finishing compounds are described, together with the purpose, characteristics, metals for which they are recommended, and the prescribed mixture for each. The booklet is available through use of Reader Service Card.

L—722. New Bulletin on Zinc Dust—A new bulletin describing common applications of zinc dust has been issued by Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, N. Y.

The publication gives details on the advantages of zinc dust as a catalyst, purifier, precipitating agent, as an additive to grease and other materials for pipe thread lubrication, and particularly in paints. Since zinc dust paint is a natural enemy of rust it is highly effective on iron and steel, in salt air atmospheres and where the painted surface touches brine. Special zinc dust paints are made for hot surfaces and provide unusual durability when used on flue boxes, smokestacks, steam condensers, and other industrial equipment subject to high temperatures.

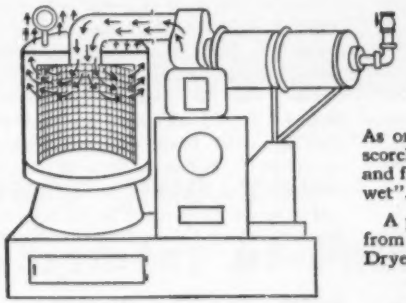
Bulletin No. 141-P on common applications of zinc dust can be obtained by writing to the manufacturer or through use of Reader Service Card.

L—723. Circuit Breaker Booklet—The application of AB-1 circuit breakers to reduce downtime and maintenance is discussed in a booklet available from the Westinghouse Electric Corporation, Pittsburgh 30, Pa.

Actual cases—with savings given—show how the replacement of fused devices by AB-1 circuit breakers results in improved continuity of operation. Complete design and operating details are provided and typical applications for each of the seven different types of enclosures are given. A basic selection-data chart for general purpose NEMA 1A sheet steel enclosures is provided as well as a downtime cost comparison sheet for circuit protection. For a copy of this booklet, use Reader Service Card.

L—724. New Folder on Preparing Material for Hot Dip Galvanizing—A 4-page 8½-inch x 11-inch folder—"Recommendations for the Proper Preparation of Materials Prior to Hot Dip Galvanizing"—has just been published by the American Hot Dip Galvanizers Association, Inc., of Pittsburgh. The folder illustrates and discusses the proper design and fabrication of a wide variety of products prior to hot dip galvanizing. For your copy use Reader Service Card.

EVER BLOW INTO AN ASH TRAY?

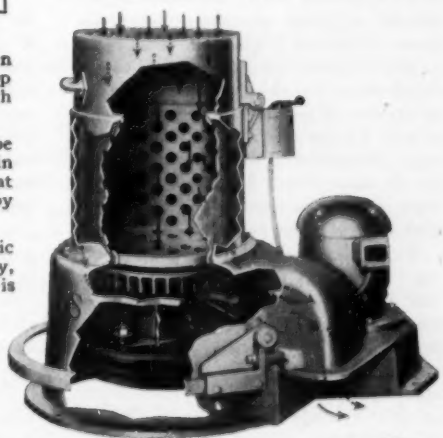


If you did, you saw a practical demonstration of the principle of air deflection. In old type dryers, air *blown* in from the top is deflected by the top layer of parts. As one user put it, "the top layer gets scorched, the next layer is nice and dry, and from there on down the parts are still wet".

A powerful suction fan *draws* the air from the bottom of the modern Nobles Dryer. Fresh air rushes in from the top to fill the vacuum and is drawn through the entire contents from top to bottom where it is expelled with the water.

Steam or electric heaters may be mounted compactly in the cover in contrast with space consuming, heat wasting, separate units connected by pipe.

An internal expanding, hydraulic brake stops the machine smoothly, and quickly. The "brake pedal" is a ring extending around the entire working area so that the machine can be stopped instantly from any working position. In the interest of faster drying and lower costs write today!



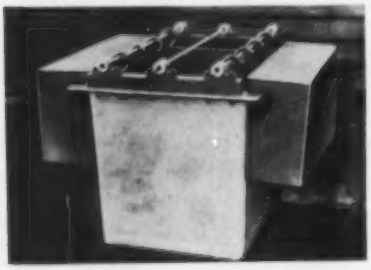
NOBLES ENGINEERING & MANUFACTURING CO.

849 EAST SEVENTH STREET ST. PAUL 6, MINNESOTA

WRITE FOR FREE Folder

Equipment and Supplies

E—725. H-VW-M Announces New Fiberglas Plating Tank—Hanson-Van Winkle-Munning Company, Matawan, N. J., offers a new seamless Fiberglas tank for use with all solutions generally used in the plating field with the exception of



caustic cleaner and hydrofluoric acid. Fiberglas tanks cost from 5 to 29 per cent less than lined steel tanks and are equally impervious to chemical attack.

Temperatures of tank contents may be as high as 220° F. Tanks can be furnished in any size required. Fiberglas mat is impregnated with Vibrin resin and actually custom molded to the exact size desired by the customer. Standard finish is gray. For full details write E. P. Hanlon, Hanson-Van Winkle-Munning Company, Matawan, N. J., or use Reader Service Card.

E—726. Improved Phosphate Cleaner—Klem Chemicals, Inc., 14401 Lanson Ave., Dearborn, Mich., announces an improved one-stage phosphate cleaner for more economical preparation of all types of metal surfaces for painting. Known as Minit-Kote, the cleaner now removes in as little as 60 seconds, at a concentration of only 1/4 per cent to 2 per cent by volume, all traces of oil, dirt, rust and tarnish. At the same time it deposits a light, uniform phosphate coating on the surface that assures better paint adhesion.

It is especially designed for use in spray type washers at temperatures of 160° to 180° F. Its fast, safe action makes obsolete 3- and 5-stage cleaning methods, saving the time and floor space required for the extra operations. No special handling equipment is required. Further details on this one-stage cleaner may be obtained by using Reader Service Card.

E—727. New Apron Requires No Laundering—In the new utility apron developed by the Utility Apron Company, 53 W. Jackson Blvd., Chicago 4, Ill., apron laundering expense is eliminated for the life of the apron. Made of industrial "durawear" fabric—as different from ordinary plastic as night is from day because it is absolutely resistant to animal fats and greases—the utility apron is amazingly soft, possesses exceptional tensile strength for long-life durability and is surprisingly easy to clean with a damp cloth. The use of this remarkable fabric is the biggest single improvement in commercial and industrial aprons in the past ten years.

No laundering is required, and the apron is water, stain, acid, mildew resistant and it won't crack, or peal. For additional information use Reader Service Card.

E—728. Stainless Steel Coating Type of Finish—A new line of products now available under the trade name Steelast has come out of the research work done on Stainless Steel Coating by Steelcote Manufacturing Company, St. Louis, Mo. The formula for Steelast products is basically the same as that of Stainless Steel Coating in that both use a vinyl plastic vehicle, the primary difference being that a change of pigment makes possible the manufacture of all colors including: Black, White, Gray, Ivory, Green, Red Orange and Yellow.

The uses in which Steelast offers advantages over ordinary coatings are protection and finishing of metal surfaces on original equipment, and maintenance of machinery, pipes, tanks, duct work and metal building materials, indoors and out. Steelast can be sprayed, brushed or dipped. It will withstand constant wet heat up to 180° F and constant dry heat up to 300° F. It dries in 30 to 60 minutes after spraying; 2 to 3 hours for recoating and may be force dried in 10 minutes. For additional information use Reader Service Card.

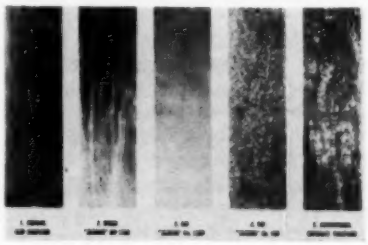
E—729. Plastic Centrifugal Pump—A new solid plastic centrifugal pump made of a composition containing a phenol-formaldehyde resin or furfuryl alcohol resin and an inert filler of asbestos or graphite for handling acids, bases, salts, and many solvents and other chemicals has been introduced by the Centrifugal Pump Division of Mission Manufacturing Company, Houston, Texas. The new pump features a solid plastic concentric casing with solid plastic semi-open impeller. The design contains many outstanding new features such as a long heavy bearing housing which insures perfect alignment.

The Mission centrifugal solid plastic pump is made in 3-inch suction 2-inch discharge size only. Operating at 1750 rpm the pump will handle capacities up to 300 gpm and heads up to 110 feet. This pump is suitable for operating temperatures up to 265° F. It is not subject to thermal shock even if operated over a wide range of temperatures. For additional information use Reader Service Card.

E—730. Simple Liquid Transfer Device—The transference of liquids such as solvents, alkalies and acids is a simple matter with the new Frinet acid pump. It is particularly suited for transfer of corrosive materials from carboys to smaller containers for all parts are of acid-resisting plastic, and it is usable for temperatures up to 40° C.

The patented unit comprises four elements, a standpipe, a rubber stopper, a foot pump and a safety valve. The standpipe is adjusted to the depth of the container by moving it up or down inside the rubber stopper. (Tapered stopper fits wide range of container mouth openings.) Air pressure to force out liquid is provided by foot pump. Pulling the handle of the safety valve immediately stops flow, and avoids splashing as vacuum action will draw back instantly all liquid in the standpipe. There are no moving parts to wear out or jam. Complete details are available from Paul C. Roche Company, Inc., 11P Park Place, New York 7, N. Y., or through use of Reader Service Card.

E—731. New Development in Aluminum Protection—The effectiveness of "Alodine" No. 1200 in a 500-hour salt spray test is demonstrated in a recent release by the American Chemical Paint



Company, Ambler, Pa. The new Alodine not only retards visible corrosion and pitting of aluminum but the loss of ductility of the treated metal after 1000 hours salt spray is less than that found with other treatments. For more information on this process use Reader Service Card.

E—732. Utility Water Bath—Blue M Electric Company, 306 W. 69th St., Chicago 21, Ill., announces the release of its new Magni-Whirl utility water bath. It obsoletes the need for any stirrers or circulating systems, yet provides complete gentle agitation in all areas of the liquid mass irrespective of how heavily the bath is loaded with test specimens. This is accomplished by means of an automatic self-timing electro magnet below bottom wall of bath, which periodically pulls the Magni-Whirl flexible circulator plate (a perforated plate) up and down. This built-in automatic stirrer and circulating system automatically maintains temperatures from ambient to 100° C throughout entire water mass to within plus or minus ¼° C.

Ironsides' fleet of tank cars has recently been increased . . . now Palmoshield can be rushed to you the same day it is ordered.

New tank cars give you same day shipment of Palmoshield

Now a call to Ironsides gives you same day shipment. New tank cars have been added to our fleet to meet the growing demand for Palmoshield.

What's more you can be *sure* you'll receive the tin plate lubricant you need when you use Palmoshield. For Palmoshield is shipped by land from the heart of the steel industry — not by sea from foreign controlled sources.

Advantages of Palmoshield

Palmoshield looks, feels and acts like palm oil and requires no changes in mill operation.

Palmoshield is made from freely available domestic materials — not from materials found half-a-world away.

Palmoshield can be secured by a call to Ironsides in centrally located Columbus, Ohio. It need not be stockpiled.

Palmoshield is tailor made to meet your own special requirements. Free fatty acid can be controlled to within ½%.

Palmoshield increases production

Recently a leading steel company during a run of 20 consecutive shifts increased production 15% over the average output with imported oil. In addition, one company broke the single shift record, and still another broke both 8-hour and 24-hour records. This was done with no increase in manpower and no change in mill operation.

Result of 60 years of specialization

Palmoshield is a product resulting from Ironsides' 60 years of specialized research in the field of scientific lubrication.

For assistance and information about your lubricating problems, call or write The Ironsides Company, 270 West Mound Street, Columbus, O.

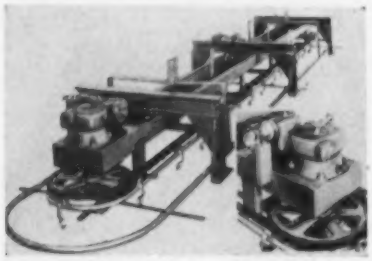
SPECIAL LUBRICANTS and PRESERVATIVES

IRONSIDES SHIELD PRODUCTS **PALMOSHIELD**

Equipment and Supplies

The Magni-Whirl is the only water bath which has 100 per cent working area always usable. It requires no repairs, no oiling and no adjustments. Thus, saves cost, time and additional equipment. For more information use Reader Service Card.

E—733. Wagner Equipment Doubles Production—Wagner Brothers, Inc., 425 Midland, Detroit 3, Mich., has designed a new packaged semi-automatic plating system to replace or augment still tank



plating. With standard types and several variances now installed and in production, users consistently report increases of 100 per cent more production and higher quality at the same labor cost as for previous still tank methods. Features of the new design are the result of the practical metal-finishing experience of company representatives, technicians and engineering personnel applied to plating problems which have existed since the beginning of mass production. Number one advantage of the Wagner semi-automatic is its versatility; the system may be altered for a different job by simply shifting the "pusher shoes" to the desired spacing; a second advantage is in the reduction of maintenance costs—the standard roller chain is available everywhere, and the Micarta pusher shoes last indefinitely. For more information on this equipment use Reader Service Card.

E—734. Redesigned Portable Galvanometer—A redesigned line of high-sensitivity portable galvanometers, useful in both laboratory and factory for measuring low values of current or voltage, has been announced by the General Electric Company's Meter and Instrument Department.

High sensitivity of the new equipment is made possible by alnico magnets which give a field of more than twice the strength obtainable with chrome-steel magnets heretofore used, according to G-E engineers.

Applications for the portable galvanometers include temporary or permanent installation for testing of instruments, materials, and many types of apparatus. The units also may be used with bridges and other devices which require an external galvanometer. Reflecting elements are available for use in applications where galvanometer elements are to be built into special assemblies. For more information use Reader Service Card.

E—735. Flame Spraying Equipment for Thermoplastics—American Agile Corporation, P. O. Box 168, Bedford, Ohio, announces a new model flame spray gun and material hopper designed for flame spraying of several thermoplastic materials.

The new design incorporates a new type of jet-tube feeding arrangement which assures uniform powder supply into the spray gun and consequent even deposition of the flame sprayed coating.

This flame spray equipment is primarily intended for production of coatings from materials which do not readily dissolve in common solvents at normal operating temperatures, such as polyethylene. Polyethylene flame sprayed coatings can be obtained ranging in thickness from 1/32 inch to about 1/4 inch. For further information use Reader Service Card.

E—736. Small Parts Cabinets—Precision Equipment Company, 3714 Milwaukee Ave., Chicago 41, Ill., announces production of all-steel Little Gem tiny parts cabinets, a new idea in small parts storage, for use in industrial plants and offices.

Little Gems consist of two 1½-inch high drawers in a rugged one-piece welded frame, having an overall size of 3¼ x 11 x 11 inches. Each drawer is furnished with 8 dividers, giving the cabinet a total of 24 adjustable compartments. Adding extra dividers makes possible a total of 56 compartments per unit. Tabs turn up and engage shelf above to prevent tipping when used as an insert in shelving. Any number of units may be stacked in one solid, rugged assembly. For further information use Reader Service Card.

E—737. Phosphate Coatings with Improved Impact-Resistance—An improved modification of Chem-Bond, an acid phosphate cleaner has recently been introduced by the Bell-Ray Chemical Corporation, 524 W. Madison St., Milwaukee 4, Wis. This metal conditioner, which in one single step removes rust, corrosion, grease and mill oil, also prevents corrosion and oxidation and establishes a new type phosphate coating, to which paint, enamel, lacquer and plating will adhere securely. Chem-Bond is applicable as an immersion dip, a brush-on wipe-off operation or as a spray. For more information on this material use Reader Service Card.

E—738. Drum Safety Vent—Vent-A-Drum, the new safety valve designed by the Central Safety Equipment Company, 2201 E. Huntingdon St., Philadelphia 25, Pa., to control and prevent explosions caused by pressure expansion in 50-gallon

metal drums containing flammable liquids, has just been approved by the Factory Mutual Laboratories. The approval covers the use of the valve on drums containing all flammable liquids with the exception of carbon disulfide and diethyl ether.

Easily screwed into the bung opening of a standard 50-gallon metal drum by hand, Vent-A-Drum functions through a series of six automatic actions. It weighs less than two pounds and measures about 3½ inches high, and can be installed easily—without the use of tools. Further information is available by using Reader Service Card.

E—739. New Salt Tablet Dispenser—Heat fatigue and loss of body salt due to excessive sweating affects the worker and his work. Slow-downs due to the need for vital salt replacement can be avoided. According to General Scientific Equipment Company, 2700 W. Huntingdon St., Philadelphia 32, Pa., costly man-hour loss is unnecessary when dispensers are close by with an ever-ready supply of salt tablets.

The GS Ace salt tablet dispenser offers dependable service in factory, shop or office. New, different, economical, sanitary—95 per cent glass and plastic, strong, simple and foolproof, it is ornamental at any fountain and holds 750 ten-grain salt tablets. For complete information use Reader Service Card.

E—740. Portable Inspection Lamps—Stocker & Yale, Marblehead, Mass., offer two new fluorescent portable inspection units with or without magnification. An ideal cool light source, designed primarily for use wherever close viewing is necessary, these units offer intense, glare-free white light without the objection of heat and at low cost.

Small in size yet large in ability the two- or four-power lens is straddled by twin fluorescent lamps for maximum see-

RESEARCH

WHO BENEFITS FROM RESEARCH

THE obvious answer to this is Everyone. You need only to look about you at the home you live in, the automobile you drive, the hospital that administers to your physical ailments, the pleasure and convenience of television, the radio, electric lights, the airplane. We could go on and on filling several pages listing the uncountable benefits that all of us enjoy today that our grandparents did not have. All of these new developments can be compared to children conceived in research and raised in the family of development. Few of us have contributed either directly or indirectly to the development of these benefits that we enjoy today, and yet all of us receive the benefits.

Only about 1% of the 170,000 industrial establishments in the United States maintain Research Laboratories and with few exceptions these are limited to the large corporations. It has been estimated that the total annual value of the Nation's manufactured products is approximately 50 billion dollars, and that the total annual expenditure for research by industry is about 100 million dollars, considerably less than ½ of 1%. Although many of these developments are for the benefit of the general public, most of them are reserved for competitive advantages.

In order to sustain the advancements made in the field of metal finishing, it is evident that an active research program should exist for the advancement of the industry as a whole, rather than for a few people who might recognize individual economic advantages. Such a program does exist sponsored by the American Electroplaters' Society. Support of the research program by the general membership is in no way proportionate to the benefits from this program enjoyed by all of the members. Obviously the greater the support for this program, the greater will be the returns in the form of knowledge vital to all who are active in the field of metal finishing.

If the national average is ½ of 1% of the total value of goods produced expended for research, is it too much to expect that this same percentage be spent by those engaged in metal finishing for the advancement of this science?

INVEST NOW IN A.E.S. RESEARCH

Equipment and Supplies

ing ability and comfort. These new Lite-Mite units can be equipped instantly for ultra-violet radiation. For more information use Reader Service Card.

E—741. New Daniels Barrels for High Temperatures—To meet the industry's demands for plating barrel cylinders that will stand up to the increasingly popular high-speed solutions operating at high temperatures, the Daniels Plating Barrel

& Supply Company, Newark 5, N. J., has developed a new line of cylinders fabricated of duPont high-temperature Lucite, of Fibreglas (Pla-Tank) and of plastisol-covered steel.

Another addition to the Daniels line is the new octagonal cylinder that is interchangeable with the round while allowing approximately 10 per cent greater load capacity. The octagonal cylinders add a slight agitation to the plating load thereby reducing plating time and insuring more uniformity.

All the cylinders can be supplied with either perforations or slots, and each type of cylinder has been designed to meet a modern plating need.

For additional data on these cylinders use Reader Service Card.

E—742. New Products for Protecting Aluminum and Other Metals—Two new and easy-to-use products that reduce by approximately 66 per cent the cost of cleaning aluminum, stainless steel and chrome surfaces have recently been developed by the Lumin Sales Corporation, 270 Park Ave., New York 22, N. Y. The materials also protect these metals from discoloration, oxidation, corrosion and pitting by providing protective coating against the elements.

Called Lumin Cleaner and Lumin Wash, they have been extensively tested, and their use on aluminum has been approved and recommended by the Aluminum Company of America.

Time-study tests made in actual use have shown that the new Lumin products save as much as two-thirds of the former cost of maintenance work on these metal surfaces. Further information may be obtained by using Reader Service Card.

E—743. Relay Rectifier-Suppressor—A rectifier-suppressor for use with d-c relays has been developed by International Rectifier Corporation of El Segundo, Calif. The Type D-2906 is encapsulated within a thermosetting plastic material offering complete protection in adverse environmental conditions such as moisture, fungus, salt spray and corrosive vapors. The unit consists of two elements, one provides half wave rectification of the a-c input and the other provides a path for the current resulting from the collapse of the magnetic field of the relay coil during the non-conducting half-cycle. This arrangement provides chatter-free operation of the relay.

The unit is rated 48 volts maximum input and 5 ma output at 100° C, and is an ideal one for operation of 30 volt d-c relays from an a-c supply. For more information use Reader Service Card.

E—744. Small Parts Power Washing Machine—G. S. Blakeslee & Co., Chicago 50, Ill., offer a standard small parts power washing machine designed for low production jobs or for cleaning between operations. A standard unit, tank and tables are so arranged that two units can be teamed together for a wash-and-rinse operation. It is equipped with a wheel roller conveyor, designed for standard work baskets, and incorporates all the quality features found in the more expensive high-production conveyorized-power washing machines. For more information use Reader Service Card.

E—745. New Maintenance Instrument—As a practical help in maintenance, testing and inspection, Anco Instrument Division, 4254 W. Arthington St., Chicago 24, Ill., has just introduced a new audiovideo model of the Elec-Detec, portable electronic instrument designed for locating noise sources in all types of mechanical equipment. The unit, Model V includes a milliammeter for checking sound impulses visually, in addition to the standard headphones for audible operation. The combination, it is stated, enables the operator to "see as well as hear" the location of the source of trouble in bearings, pistons, gears, ratchets, cams, clutches and other moving parts. For additional information use Reader Service Card.

E—746. Unique Humidity Indicator—Andrew Technical Service, 3805 N. Clark St., Chicago, Ill., announces an expanded variety of humidity indicating cards, under the trade-name, "Humigraph". The basic card contains seven indicator spots the colors of which change from blue to lavender to pink under atmospheric humidity changes. The card is scaled to show relative humidity by reference to the color change spots.

Applications are widespread in process plant and laboratory work, where quick and simple indications of humidity are essential. Costing only a few cents each, the cards are also extensively used by equipment manufacturers, as well as producers of materials whose use must reckon with the humidity factor. For further details and sample cards use Reader Service Card.

E—747. H-VW-M Develops Improved Rectifier—An improved selenium rectifier in both self-contained and remote control models has been developed for the electroplating industry by Hanson-Van Winkle-Munning Company, Matawan, N. J. The new rectifier has a combination of features that have never before been offered in a single commercial rectifier used in electroplating operations.

The unit delivers a full wave, six-phase current with a theoretical ripple of 4.5 per cent. AC input is dual—220/440 volt, three phase, 60 cycle. H-VW-M guarantees continuous operation at full capacity, 24 hours a day, for a full year.

The self-contained model houses all the equipment and electrical devices that make up the complete rectifier unit—selenium stacks, transformers, cooling fan, magnetic devices, protective mechanisms, starter, meters and voltage control mechanisms. Size of the 12/24-volt (1500/750 amps), self-contained unit is 24 inches wide, 26 inches deep and 65 inches high.

The remote control model is built in two units; one containing the controls that house the starter, meters and voltage control mechanism, and the other unit houses the other rectifier equipment. The control unit, which may be located anywhere in the plant, handles as many basic rectifier units as are needed in any single electroplating operation.

For more information on the new rectifier write to J. P. Karinja, Hanson-Van Winkle-Munning, Matawan, N. J., or use Reader Service Card.

E—748. Hard Vinyl Nameplates for Permanent Identification—The harassing problem of keeping nameplates and instrument panels intact in corrosive en-

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3. Such amazing covering power that many times inside anodes are eliminated to cover and plate recesses.

4. Maximum brilliance of deposit, greatest possible ease of control of the bath and widest plating range combine to make ROHCO 20XL the outstanding brightener. There just isn't anything like ROHCO 20XL—ask the man who's using it! ROHCO 20XL is the original liquid brightener—for ease of addition, but also available in powder if you prefer!

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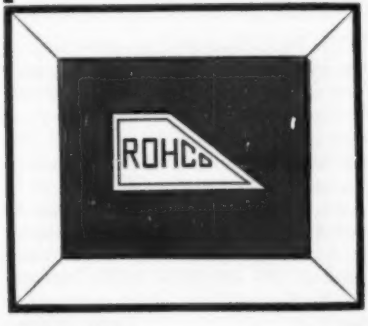

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Please send details on ROHCO 20XL CADMIUM BRIGHTENER!

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Equipment and Supplies

vironments has been solved by American Lucoflex, Inc., 1 E. 57th St., New York City. Lucoflex, a non-plasticized polyvinyl chloride plastic, resists the action of most solvents, brine, and other corrosives. This resistance, plus ease of coloring, shaping, and decorating, suggest it as a substitute for metal nameplates. Unlike metals, which usually require anodizing, dichromating, or enameling, chemical resistance is inherent in the Lucoflex material itself.

The material is non-magnetic, non-galvanic, and non-conductive, making it particularly suitable for electronic equipment identification tags. Clearly imprinted dials and scales do not interfere with equipment operation and retain their legibility in corrosive atmospheres.

Factory equipment, in particular that used around corrosive substances, can be tagged, dials and gauges lettered, and instructions attached which remain functional throughout the life of the equipment. For more information use Reader Service Card.

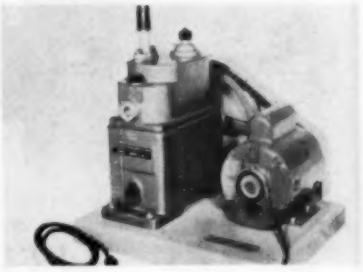
E—749. Continuous Feed Abrasive File—A new abrasive file—used like a conventional metal file, but with a cutting surface that feeds from a coated abrasive roll—has been announced by Monarch Machine Shop, Inc., Madison, Wis., and Minnesota Mining and Manufacturing Company, St. Paul, Minn.

Called the Red Flash abrasive file, the new hand tool is designed for deburring and other filing and finishing operations throughout the metalworking field.

Featuring an 11-inch stroke, the file holds a roll of more than six feet of abrasive cloth, providing a six-foot cutting efficiency at all times.

Other advantages of the new tool are faster cutting, increased versatility through a wide choice of abrasive grits, and greater economy, since only the cutting surface—rather than the entire file—is replaced when it becomes dull. For more information use Reader Service Card.

E—750. Rotary Gas Ballast Pumps—Mechanical high vacuum pumps which will pump condensible vapors, such as water vapor, without oil contamination or loss of pumping capacity, are now avail-



able. The introduction of the NRC rotary gas ballast pump is the result of joint efforts of National Research Corporation, 70 Memorial Dr., Cambridge, Mass., and E. Leybold's Nachfolger, of Cologne, Germany, the world's oldest manufacturer of vacuum equipment. National Research Corporation is importing the basic pump units and is adding American motors, pulleys, flanges and controls.

The NRC pump prevents the condensation of vapors by keeping the vapor pressure of the vapors below their condensation pressures. This is done by use of gas ballast. A small quantity of air is bled into the pump after intake has been completed and as compression is about to occur. The power requirements are as low or lower than those for conventional mechanical pumps lacking the gas ballast feature. For additional information use Reader Service Card.

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the world's finest

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PLATING RECTIFIERS

SEL-REX only makes *ONE QUALITY* — the world's finest! Yes, the world's finest engineering, the finest pre-tested components, the most stringent quality control . . . from top to bottom. SEL-REX adheres to high NEMA standards for the betterment of the plating industry. It does not pay to experiment with so called "budget-priced" equipment for it is a fact that a SEL-REX PLATING RECTIFIER *is the MOST ECONOMICAL* investment in the long run. Only SEL-REX Rectifiers are unconditionally guaranteed for 2 years.

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COATINGS for METALS
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How to Find The Right Finish for Zinc

RECTIFIERS WITH MANY ADVANTAGES FOR PLATERS

With Unichrome Rectifiers, platers are getting the benefit of a power supply designed for them. These units have more than the usual number of selenium plates to guard against overheating. Stack assemblies "float" with no rigid connections for protection against mechanical shock. Units are delivered completely assembled to save wiring headaches. They are conservatively constructed and rated, for longer life. They're protected against corrosion. And they are available now, in many outputs that permit *close* matching to current needs, thereby avoiding expense of extra capacity.

Formula for a chromium-bright lasting zinc finish

Here's the "substitute" finish that became standard for so many products because of its quality. First, a plate of .0002" to .0005" of zinc on the product. Then a quick dipping in Unichrome *Clear Dip* Solution for brilliance and corrosion resistance. Lastly, a Unichrome Clear Enamel which seals in the brilliance despite handling and exposure.

Copper platers doing smoother, faster work

In recent months, many plants have installed the Unichrome Copper Plating Process as they got into full swing again on copper plating. When it came time to increase capacity, new tanks also got Unichrome Copper. For obvious reasons. The bath plated fast. The deposits were smooth. Buffing costs were reduced because the finish buffed *easily*, if it needed buffing *at all*. The bath contains no cyanide.

UNITED CHROMIUM, INCORPORATED
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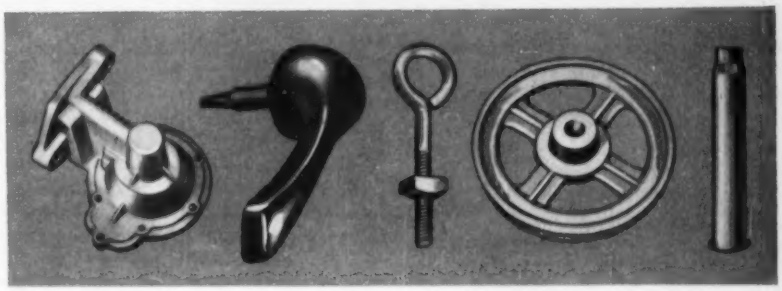
Complete line of chromate treatments gives finishers greater control over type of process, color, costs and operating method



Improved chromate-treating methods have been largely responsible for the increased use of zinc as a finish in the past several years. For several reasons. They give zinc the extra protection against corrosion required by Government specifications. They can produce attractive decorative finishes. They provide a base for better adhesion of paint and lacquer.

Today, United Chromium offers metal finishers and designers the most complete line of chromate treatments available. This wide choice results in substantial benefits because it means a finish not "almost as good as" but rather the one that best meets the user's needs.

TWO WAYS TO PROCESS— DIFFERENT COLORS

By straight chemical conversion, Unichrome Dip solutions produce black, olive drab, brass-yellow, iridescent yellow or clear chromate coatings in 5 seconds to 2 minutes. The black and olive drab processes can produce finishes with the eye appeal of glossy enamel. Unichrome Dips use simple equipment, minimize installation costs.

The Anozinc* processes produce black, yellow or clear coatings *electrolytically*. These are tough, very economical finishes that can be handled while wet.

With both Anozinc and Unichrome Dip processes, the finish becomes an integral part of the zinc coating.

WHAT THE RIGHT FINISH MEANS

To a company treating zinc plated hardware, Unichrome Dip No. 95 means better "mileage" and a brighter, more corrosion resistant finish than formerly obtained.

To a plating superintendent, Unichrome Dip No. 98 means reduced costs, because he uses only half as much compound as before in make-up, and gets a solution with longer life.

To companies turning out zinc plated shell cases, Anozinc* means more economically producing a uniform, brassy protective finish inside and out. On a run of 26,000 20 mm cases, for example, one company got only 84 rejects.

To another user, Unichrome Dip 1081 —a *dry* compound—meant reduced shipping costs and fewer glass carboys to handle.

To a well known automotive supplier who replaced a "home made" chromate solution, Unichrome Dip No. 95 meant a 33% saving on materials cost alone.

In all cases, using a Unichrome process also means the service and experience of a United Chromium engineer who is often instrumental in ironing out users' operating problems.

SEND FOR SPECIFICATION CHART

A chart to save time and help locate the best-suited chromate-treating material is available. Also Bullein CC-1 describing Unichrome Dips and Anozinc. Write for your copies. **Trade Mark*

Mail Box

Subject: Stripping of Chromium From Zinc

DEAR SIR:

On page 170 of the February issue of PLATING, the answer given to Q. 152 concerning stripping of chromium from zinc is not completely satisfactory. I would like to submit the results of some of the work I did at this Bureau in the course of an A. E. S. project about 20 years ago.

Chromium can be anodically stripped from zinc or cadmium by the use of reversed current in sulfuric acid or in a solution containing sodium sulfide and sodium hydroxide. The former method may be quite satisfactory for commercial work. The latter method permits the chromium to be stripped almost quantitatively so that it could be used for a thickness determination. The details follow:

Stripping of Chromium from Zinc and Cadmium

Chromium from Zinc

For analytically stripping chromium from zinc, a solution of 0.5 normal in NaOH (20 g/l) and 0.25 normal in Na_2S (30 g/l of $Na_2S.9H_2O$) is suitable. The object is made anodic at 2 amp/dm², which requires about 3.5 volts. The Na_2S protects the zinc from attack; however, if an Na_2S solution alone were used, the chromate would be reduced to insoluble Cr^{III} compounds on the surface of the zinc and the object would weigh too heavy. In the presence of sodium hydroxide, the chromate formed is only slowly reduced. When all the chromium has been stripped, the current quickly drops to less than 0.01 amp/dm². The object is then removed and the fine silt (of sulfur?) wiped off. The loss in weight of zinc is about 2 to 3 mg/dm², which amounts to an error of 5 to 10 per cent for a 0.00002 inch chromium coating (Cr = 0.034 g/dm²). If the chromium has been stripped from a polished zinc-base, the surface will be left almost as bright as it was before plating.

Chromium from Cadmium

For analytical stripping, a 1.0N solution of sodium hydroxide with reversed current is employed. The initial current density used is 2 to 3 amp/dm². (Voltage required is about 3.5.) When stripping is completed, the current density drops to about 1 amp/dm². The cadmium surface is left with a dull grey-brown color.

Another reagent which can be used is a solution 1.0N in NaOH (40 g/l) and 0.10N in Na_2S (12.5 g/l of $Na_2S.9H_2O$).

It is operated similarly as the bath described above for zinc. After removal from the stripping solution, the cadmium is given a dip in a 0.5N solution of sodium cyanide. It then possesses a smooth gunmetal black appearance.

With either reagent cadmium gains in weight about 2 mg/dm², which amounts to an error of 5 to 10 per cent in stripping a 0.00002 inch chromium coating. It has not been determined which method is the more reliable. In any case, the article must be removed as soon as stripping is completed, or it will continue to gain in weight.

For the purpose of stripping chromium for replating, the caustic soda solution is suitable for cadmium base, but not for zinc. Chromium may be stripped from both cadmium and zinc in concentrated sulfuric acid with reversed current. In the latter stripping bath, zinc loses 0.02 g/dm² and cadmium 0.04 g/dm². The base-metal should require only a slight amount of buffing prior to replating.

ABNER BRENNER

Subject: Further Impressions of Australia

We left Melbourne on March 30, spent two weeks in Adelaide, and have now completed one week of a four weeks' stay in Sydney. We will return to Melbourne for their convention from May 18 to 20, and after a few days in Brisbane will fly home on May 30, and attend the Philadelphia A. E. S. Convention in June.

In each city, the A. E. S. committee has made detailed plans, not only for the lectures and plant visits, but also for auto trips and visits to their homes. We have made so many good friends in each city that when the time comes to leave, we feel homesick. In Adelaide the Branch gave a dinner at which they presented to Mrs. Blum a large birthday cake, on which were decorated an Australian flag and an American flag, with a dove joining them, a beautiful symbol of their friendship. When we left Adelaide Airport at 7:00 A. M. there were 20 there from the A. E. S. to see us off, including 9 children. At Sydney we were met by a committee of 9 men and one lady. We are literally treated royally everywhere. Friends bring flowers to our room several times a week, and the flowers here are really beautiful.

The attendance and interest at the lectures is very encouraging. Many of these lectures are given at the Universities, with members of Chemical Societies and metallurgical groups as well as A. E. S. members. This cordial association of the platers and other technical groups is an evidence of the progressive spirit in Australia.

I have not visited many plating plants, frankly because of so many other demands on my time. Those visited are not very large by American standards but they are modern and progressive. The largest plating plant in Australia is the General Motors-Holden plant in Adelaide, where the procedures are much like those in Detroit.

I feel that I have come to know the platers here and their interests and problems, as revealed in discussions following lectures, and in personal conversations. Both we and they are grateful that this trip to Australia was made possible by the A. E. S., to the benefit of both countries.

We are looking forward to the A. E. S. Convention in Philadelphia, where we will have more to tell about this interesting land "down under".

WILLIAM BLUM

Subject: Length of Membership

DEAR SIR:

Some time ago I read in the "News from California", by Fred A. Herr that a total of 134 years of membership in the American Electroplaters' Society was represented by 4 members seated at the same table at the May meeting (1952) of Los Angeles Branch of the A. E. S. They included:

Ernest L. Lamoreaux	35 years
Clarence E. Thornton	35 years
Frank Rushton	32 years
Rudy J. Hazicha	32 years
Total	134 years

I wish to submit the names of 4 Newark Branch members who have 221 years of electroplating experience, and have been members of the A. E. S. a total of 168 years.

	Yrs. in Plating		Yrs. in A.E.S.
E. W. Faint	63		44
G. B. Hogaboom, Sr.	57		44
Royal F. Clark, Sr.	53		44
S. Glickenhaus	48		36
Total	221		168
I could add	46	G. Reuter	40
	46	S. Taylor	40
1953 Total	313		248

That is sure a lot of plating.

ROYAL F. CLARK, SR.

Subject: Electropolishing

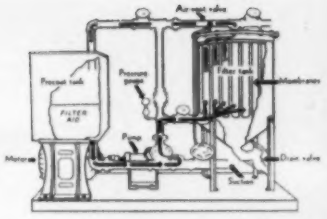
DEAR SIR:

In Ezra Blount's report on Japanese electroplating practice in the May issue of PLATING, he describes electropolishing in phosphoric acid—sulfuric acid—chromic acid—solution on page 482 as part of the Japanese practice. Readers may be interested in knowing that this solution composition is covered in U. S. Patents 2,338,321 for electropolishing steel and 2,550,544 for electropolishing aluminum.

CHARLES L. FAUST

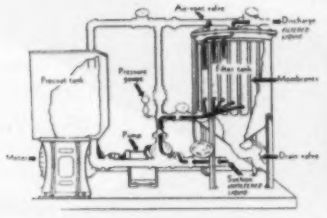
PRECOATING

requires only minutes. Filter-Aid is evenly distributed. No time waste . . . no material waste.



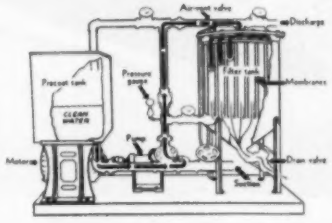
FILTERING

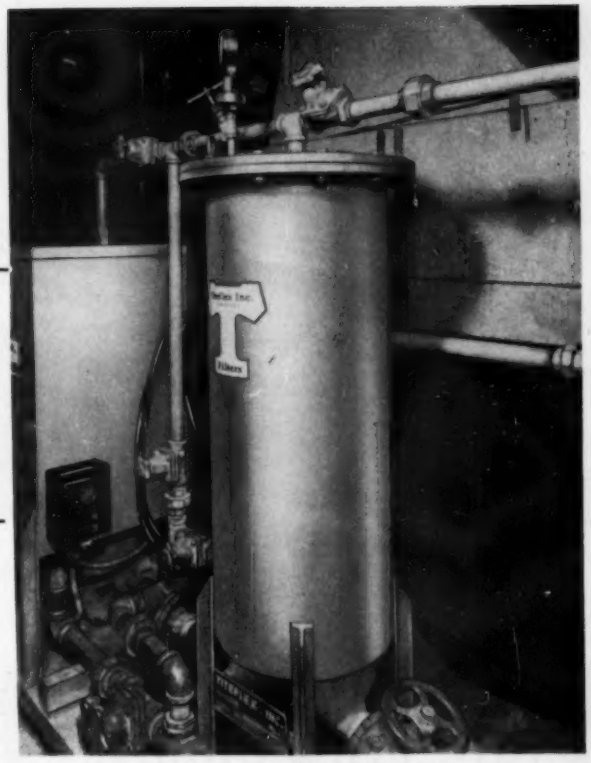
is simple . . . sure. Suspended particles down to 1/10 micron are removed. Color . . . taste . . . smell . . . chemical composition are unaffected.



CLEANING

is fast . . . easy. Simple reversal of flow for backwashing at pressures up to 100 psi insures complete cake-break-up. Cleaning is complete in minutes . . . no manual removal of residue.





Titeflex filter installation in filter department at Stromberg-Carlson, Rochester, N. Y.

How Titeflex Simplicity Saves Time and Money for STROMBERG-CARLSON

Removal of anode sludge from Zn $(CN)_2$ type bath in Stromberg-Carlson's Zinc Plating operation has been no problem since they installed a Titeflex filter.

Simplicity Keynotes Operation

Real economy results from Titeflex simplicity. They save time because filter can be cleaned easily, in minutes, on a daily basis. They save money because no replacement of filter-bags or other elements is needed. They save on rejections because daily cleaning results in better, more uniform plating.

Titeflex Filters Can Help you

For every filtering operation large or small there is a Titeflex filter to do the job — and do it better. Capacities from 200-1000 G.P.H. up . . . filter areas from 5 to 450 square feet are available as standard construction or on special order. Find out more about Titeflex filters . . . and what they can do for you . . . today, Clip and mail the coupon for complete information without obligation.

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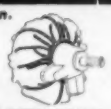

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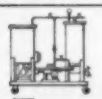

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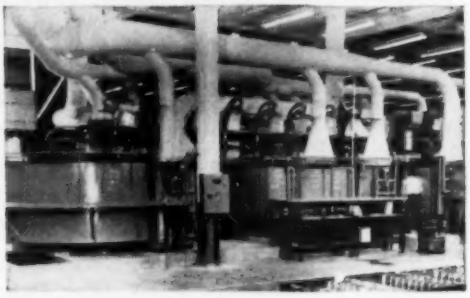

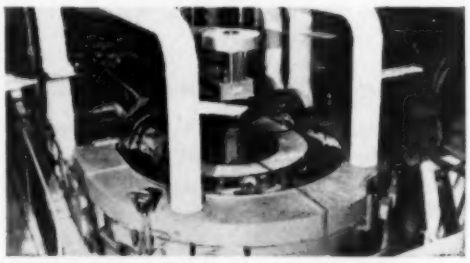

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The A. V. Roe Company, Ltd., manufactures the famous ORENDA jet engine for the AVRO CF-100 all-weather fighter. They must meet very exacting metal finish processing requirements.

That's why A. V. Roe selected Frederic B. Stevens of Canada, Ltd., to outfit their Malton, Ontario, Jet Engine Plant with Stevens Automatic Plating and Processing Equipment.

Stevens automatic anodizing, chromating and blackening machines assure metal finish processing that will meet critical specifications while performing as a routine production operation.

If you have a problem involving plating, bright dipping, cleaning and pickling or any other metal finishing process, see your nearest Stevens sales engineer or write direct.

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EVERYTHING FOR METAL FINISHING
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plating

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JULY, 1953 VOL. 40, No. 7

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This month's cover photo shows the handling of aluminum propeller blades after the application of a bonding material, a step in the process of nickel plating of the blades for erosion resistance.

Published by the American Electroplaters' Society. Publication Office: 5800 N. Marvine Street, Philadelphia 41, Pa. Phone: LIvingston 8-7800. Editorial, Advertising and Executive Offices: American Building, 445 Broad Street, Newark 2, N. J. Phone: Humboldt 2-3400. Subscriptions: Domestic and Canada, $4.00 for 1 year; $7.00 for 2 years; 50c per copy; Foreign, $8.00 per year; $1.00 per copy.

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PLATING is abstracted regularly in Chemical Abstracts, Metallurgical Abstracts, Engineering Index, Technical Data Digest and Bulletin Analytique.

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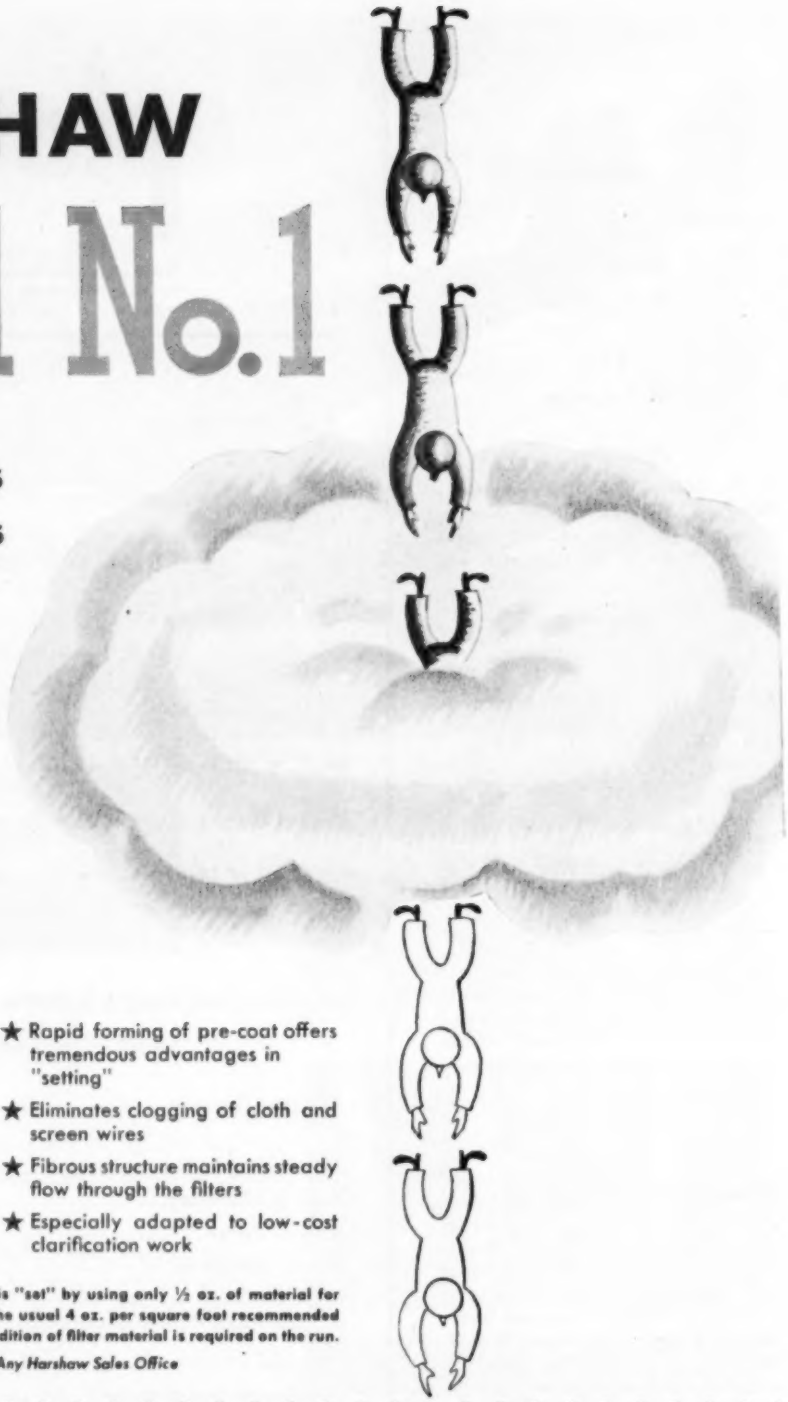

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Editorial

Never Too Soon

THE HIGHLY SUCCESSFUL technical sessions at the recent Annual Meeting of the Society were the result of the untiring efforts of the various committees, the authors and others. Contributing, in part, to this success was the early start on paper preparation that was made by the authors. Such a start permitted a full discussion on the manuscripts between the authors and the Editorial Board members which helped to make each paper an outstanding one. A high caliber of technical material for the 1954 sessions will be assured by a repetition of this successful pattern.

Many members in "the field of electroplating and of finishing of metals and of allied arts" must have had some process problem which has been solved by a novel procedure. Such experiences are the core of highly valuable technical papers. The actual writing of manuscripts requires, in some cases, the added preparation of charts, tables and other illustrative material. The months will pass by hurriedly and in some instances result in the loss of a good paper because of the insufficient amount of time remaining.

Accordingly, this early call is made—it is never too soon to prepare and submit papers for the New York Convention. The Editorial Board is now accepting papers for that Meeting and will continue to do so until January 15, 1954.

Al Korbelak

Polarographic Determination of Zinc in Alkaline Zinc Plating Solutions

The following paper is the third in its particular field published in the pages of this journal within recent months. The accuracy obtained by the authors with the use of the technique compares favorably with that obtained through use of volumetric methods.

RAFAEL DIAZ AND E. H. LINDEMANN*

Introduction

An analytical control method employing the polarograph is described for the analysis of zinc in zinc plating solutions. It is based on the fact that zinc produces a well defined wave, proportional to its concentration, in solutions containing an excess of alkali chloride. The interferences are few and not commonly encountered in zinc plating solutions but, if present, could easily be eliminated by the proper choice of supporting electrolyte or by a simple chemical separation. The polarographic determination also has the advantage that, if desired, certain metallic impurities present such as copper and lead may also be estimated provided they are reducible at the dropping mercury electrode in the medium used as supporting electrolyte and provided they give a well-defined wave suitable for measurement and proportional to the ion concentration.

According to Kolthoff and Lingane[1], "zinc produces a well-defined wave in solutions of alkali chlorides as supporting electrolyte. The wave shows a small maximum which is easily suppressed by the common maximum suppressors. In 1N potassium chloride $E_{1/2} = -1.022$ volts vs. the S. C. E. (Saturated Calomel Electrode). The reduction is reversible in this medium and the diffusion current is directly proportional to the concentration over a wide concentration range". In the authors' procedure, hydrochloric acid is added to destroy the cyanide and carbonate present. To suppress the maximum, gelatin is used in a final concentration of 0.005 per cent. Whether a smaller concentration of gelatin is equally effective in suppressing the maximum was not investigated.

Common impurities of zinc plating baths like copper and lead do not interfere with the determination because they are reduced at much more positive potentials than zinc. It should be possible, by running a complete polarogram (over the range of -0.0 to -1.6 volts of applied potential), to estimate these impurities. The polarographic detection and estimation of metal impurities in zinc and other plating baths will be investigated in the future.

*Chemical Laboratory Minneapolis Honeywell Regulator Company, Minneapolis, Minn.

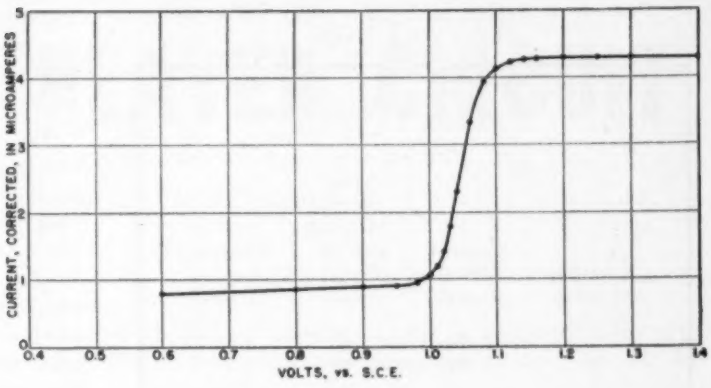


Fig. 1. Typical Polarogram of an Alkaline Zinc Plating Solution

Chromium, nickel and cobalt are the only elements which might interfere directly with the development of the zinc wave in the medium used, because of their reductions at potentials close to that of the zinc. Chromium gives a wave at −0.88 volts (S. C. E.) and may interfere if present in a relatively large amount; nickel and cobalt will interfere seriously because their waves are very close to that of zinc. The elimination of any interferences due to chromium, nickel or cobalt may possibly be dealt with by the proper choice of supporting electrolyte or by a preliminary chemical separation. In the case of zinc plating solutions the amount of the above metals which might be present as impurities would be so small as to cause no effects on the development of the zinc wave.

A typical polarogram of an alkaline zinc plating solution is shown in Fig. 1.

TABLE I. DATA FROM POLAROGRAMS OF ALKALINE ZINC PLATING SOLUTIONS OF VARIOUS CONCENTRATIONS*

Concentration of Zinc in oz/gal	Diffusion Current Microamperes†	Ratio of Diffusion Current to Concentration
0.00	———	———
1.34	0.997	0.745
2.67	2.207	0.826
4.01	3.397	0.848
5.34	4.460	0.836
		Average 0.814 ± 0.034

*Alkaline zinc plating solutions of various concentrations of zinc ion in 2M potassium chloride and gelatin as directed by the procedure. Air is removed from the solutions by bubbling nitrogen through the cell for 12 minutes. t = 3.70 sec.; $m^{2/3} t^{1/6}$ = 1.785 $mg.^{2/3}$ $sec.^{-1/2}$. Diffusion currents measured at a potential of −1.040 volts with respect to the saturated calomel electrode.

†Corrected.

Reagents and Apparatus

Potassium chloride solution, 2 molar
Gelatin solution, 1.0 per cent
Mercury, purified, for use in the dropping electrode
Electrolysis cell, H type, external electrode
Sargent, Model III manual polarograph

Zinc plating solutions for the calibration of the capillary were prepared in the laboratory from standard analytical reagents. It was desirable to establish a comparison between the ferrocyanide method and the polarographic method of analysis for alkaline zinc plating solutions. If a synthetic plating solution is used for calibration by weighing the appropriate amounts of all the components, the calculated value may be taken as a "certified" value so that both methods (ferrocyanide and polarographic) may be compared to it. It should be realized that the main errors involved in using this synthetic zinc solution would be those of weighing the zinc salt in an analytical balance and dissolving all the components of the plating solution

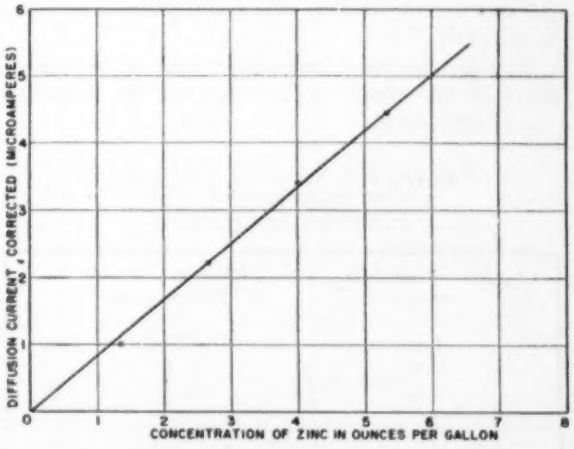


Fig. 2. Calibration Curve for Zinc in Alkaline Zinc Plating Solutions. Data from Table I

TABLE II. RESULTS OF ANALYSES OF ZINC SOLUTIONS

Solution Number	Amount Added oz/gal	Amount Found in oz/gal	
		Volumetric Method with Diphenylamine	Polarographic Method
1	1.50	1.45	1.43
2	6.00	5.87	6.05
3	4.50	4.43	4.56

to a definite volume in a calibrated volumetric vessel. They are, no doubt, much less than those involved in using a regular zinc plating solution and analyzing it by some other method (for zinc content) so as to give it a "certified" or assigned value.

Procedure

Calibration

A calibration curve was prepared by polarographing the synthetic zinc plating solutions of known concentration according to the procedure described for the analysis of the samples. Table I shows the data regarding the calibration and these are plotted in the form of a calibration curve in Fig. 2.

Zinc Plating Solution

Pipette 1.0 ml of the sample and transfer it to a tall 100 ml beaker. Add 1 ml of concentrated hydrochloric acid (HOOD) and evaporate to incipient dryness. Dissolve the residue in distilled water and transfer to a 500 ml volumetric flask, adding 5 ml of a 1 per cent gelatin solution. Cool and dilute with water to the mark.

Transfer 25.0 ml of the solution from the volumetric into a 50 ml volumetric flask and add 2N potassium chloride solution to the mark. After mixing, record the polarogram of an aliquot portion between −0.6 and −1.3 volts of applied potential against the saturated calomel electrode.

The concentration of zinc, usually expressed in ounces per gallon, is found by comparison of the height of the wave obtained with the previously prepared calibration curve. All wave heights were measured by the extrapolation method described by Kolthoff and Lingane[2]. The direct method of polarographing the supporting electrolyte alone and then correcting for its residual current would, of course, be the best, but since this extrapolation method proves to be satisfactory and less time-consuming (an important factor in routine analysis), it was used in all of the authors' measurements.

TABLE III. VALUES OBTAINED WITH SYNTHETIC ZINC PLATING SOLUTIONS

Zinc Added in oz/gal	Diffusion Current in Microamperes*
2.67	2.192
2.67	2.181
2.67	2.248
	Aver. = 2.207

*Corrected.

Results and Discussions

The results of some synthetic mixtures are shown in Table II, in comparison with the ordinary volumetric method using diphenylamine as internal indicator. They indicate that the concentration of zinc can be determined by this method to within ±5 per cent which is suitable for routine control. This is about the same accuracy obtained in the authors' laboratory by using volumetric methods.

The temperature of the electrolysis cell was controlled by a water bath at 25° ± 0.2° C.

The diffusion current was measured at a potential of −1.040 volts (S. C. E.). The reason for measuring the diffusion current at −1.040 volts is that the authors' values of $E_{\frac{1}{2}}$ came out to be −1.040 (vs. S.C.E.) instead of −1.022 volts as given in the literature. This discrepancy may be caused by such factors as a high cell resistance in the calomel electrode used for reference or less probably by using a potassium chloride solution of higher concentration than was intended. It should be mentioned, however, that the measurement of the diffusion current does not have to be made at the half-wave potential; on the contrary, measurements of the diffusion current step at a potential when the diffusion current is fully developed are usually more reliable.

Precision

As regards the precision of the measurements, Table III shows the values of the diffusion current step obtained with a synthetic alkaline zinc plating solution of 2.67 ounces per gallon of metallic zinc. From the results in Table III and the calibration chart prepared for the method, it can be calculated that the error in the precision is never over 2 per cent for the three runs analyzed.

LITERATURE CITED

[1]Koltboff and Lingane, "Polarography", Interscience Publishers, New York, 1st Edition (1941).

[2]Ibid, p. 57.

A FLEXIBLE PLATED CIRCUIT*

E. R. BOWERMAN† AND R. F. WALTON

Abstract

A cloth backed plated circuit is made by a transfer process by which a strippable copper electrodeposit and a thin polyvinyl resist are transferred to a cloth adhesive tape from a stainless steel base. The stainless steel is reusable and its surface may be patterned to identify the wiring on the unit being produced. The transfer method eliminates the need for providing, between the wires, of conductive bridges which have to be removed later. Design changes require only a change in the silk screen used to apply the resist to the stainless steel.

Introduction

The flexible plated circuit appears to fit nicely into the general methodology of fabrication of electronic equipment. Some of the current forms of printed circuitry are rigid and this is, in fact, made use of in supporting small components. On the other hand, larger equipment is going to be chassis bound for some time to come. Here, experience has shown that a state of fluctuation exists in individual terminal to terminal dimensions and elevations. Individual wires easily take this variation into account as can pig-tailed components. If the circuit is complex, it is not unusual for a number of small components to be subassembled on a terminal board where dip soldering can be used to advantage.

The Process

The production of a flexible plated circuit, simply stated, consists in silk screening a stop-off (i. e., an insulating lacquer) onto a stainless steel surface, copper plating the non stopped-off area, and stripping the plating and stop-off from the stainless surface by an adhesive tape. This is illustrated in the flow diagram (Fig. 1) which will serve as an outline of the description to follow.

Stainless Steel Preparation

Type 316 or 347 stainless steel sheet, free from blemishes, flaws and fissures, is chosen because of its resistance to chemical attack in the copper plating solution and because it can be easily maintained in the passive condition necessary for stripping the copper plating. The surface is given a mirror finish by polishing and buffing and care is exercised in handling to avoid scratches. Surface roughness has a tendency to cause adhesion of copper plating to the steel, possibly by mechanical bonding since the difficulty is noticed even with properly passivated steel. Individual scratches will be faithfully reproduced in the plating and, if sharp, will have a tendency to cause local mechanical weakness in the copper probably as the result of a notch effect. After polishing and buffing, the surface is cleaned and passivated by anodic treatment in a conventional hot alkaline steel electrocleaning solution.

Silk Screening

A reversed silk screen is prepared by conventional graphic arts procedure using a fine mesh wire cloth (140 or 160 US Std) and a film which is resistant to the stop-off lacquer and thinner. The reversed screen is necessary because of the subsequent reversal when the circuit is stripped from the stainless steel.

The stop-off lacquer is a vinyl copolymer whose vis-

Fig. 1. Flow diagram

*Presented at the National Conference on Airborne Electronics, Institute of Radio Engineers, Dayton, Ohio, May, 1953.

†Physics Laboratories, Sylvania Electric Products, Inc., Bayside, N. Y.

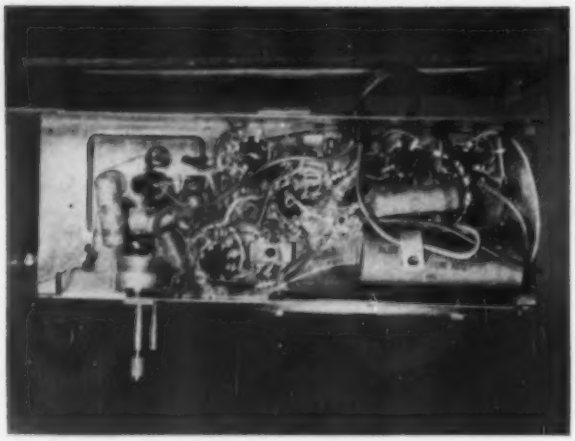


Fig. 2. Conventional chassis wiring

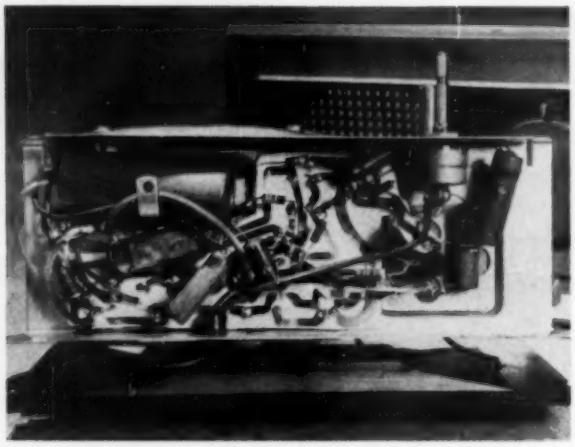


Fig. 3. Chassis with plated circuit

cosity is adjusted to approximately 200 poises by means of suitable solvents. Care is used in the screening to avoid holes or discontinuities in the lacquer film other than those of design. The evaporation rate of the solvent is adjusted in a compromise between rapid drying of the screened film and slow drying on the screen.

Electroforming Copper Wiring

After the stop-off is dry, the wiring is formed by electroplating between 1 and 3 mils of copper onto the non stopped-off stainless steel in an acid copper sulfate plating solution. A practical lower thickness limit exists in that deposits thinner than 0.7 mils have a tendency to tear when being stripped from the stainless steel. This is postulated to be due to a lower strength within the copper than in the weak bond between the copper and the stainless steel. An upper thickness limit is less easily defined but as the thickness increases the flexibility of the copper decreases and the deposit tends to spread along the surface over the stop-off. If the wiring is closely spaced, bridging may occur between wires due to the spreading deposit. For the circuitry investigated, loss in flexibility gave an upper limit at about 20 mils.

The plating solution used for the investigative work contains 250 g/l $CuSO_4 . 5H_2O$ and 75 g/l H_2SO_4 (sp. gr. 1.83). The solution was filtered through activated carbon before using and commercial electrolytic cathode copper was used as anode. The stopped-off stainless steel is connected as cathode before immersion in the plating solution so that plating starts immediately on the passive surface. The cathode is agitated during plating and a cathode current density of 100 amperes per square foot is used. In 18 minutes a 1.5 mil deposit is obtained which is suitable for 1/16 inch wide wires in receivers having series string heater connections with 150 milliampere currents. After plating the cathode is water rinsed to remove the plating solution and dried.

Stripping the Circuit

An industrial cloth backed adhesive tape is pressed against the copper plating and stop-off with sufficient pressure and time to obtain good contact to the adhesive. The tape and adhered circuit is then stripped from the steel sheet with a rapid, continuous, even pull. The stop-off also transfers and serves to cover the sticky areas of the tape not covered by the copper. The particular tape used was compounded using a thermosetting adhesive which could be cured at 250° F before use or allowed to cure in equipment. After stripping, the tape is trimmed and the required holes punched out. The stainless steel may be reused as long as the surface is maintained smooth, clean and passive.

Installation of the Plated Circuit

The flexible circuit is forced over the fixed component and tie point lugs before the small components are installed. The flexibility of circuit harness speeds up the installation by the give and take possible in cloth fabrics. Some attention to the design of the lugs will pay off in easing the assembly and reducing the necessity for hole punching to accommodate lugs. On the other hand, if highly detailed work is not being produced it is also possible to use a loose woven fabric for the adhesive tape backing which will permit the lugs to pierce it easily.

Coding of the Wiring

Since the electroforming of the copper will faithfully reproduce the surface finish of the stainless steel, it is possible to transfer certain types of designs to the copper surface beyond the obvious capabilities of outline identification techniques. Localized texturing of the stainless steel as, for example, by shot blasting, etching or engraving, will give a visual coding to the plating. Care must be used to employ only rounded and relieved designs to permit parting after plating. In addition, the deposit may have to be made a little thicker to obtain good strength for the parting operation.

Convention Echoes

"WHEREAS: Philadelphia and her sister Branches, Allentown-Reading and Lancaster, have for this happy and profitable interlude made clear by good works the inner meaning of Brotherly Love: and WHEREAS: by their deeds and devotion we have been nourished in mind and body, refreshed in spirit, and given, in a hospitable land, opportunity to renew for this fortieth time the warm associations that bind us in friendship; be it therefore RESOLVED: that as with reluctant feet we depart this City of Friends our hearts go out in thanks to those who have made this so fair a week: . . . to Sam Heiman, able and unassuming Chairman, whose competence shines reflected in the smooth stream of this week's events . . . to Delmar Robson, Harry Hovis and Norman Miller, to Bill Marcovitch and Hiram Lukens, to Old Master Ken Graham; for their contributions to administration of this Meeting and to our Joy in Living . . . to Mary Robson and her gracious entourage, of whom our wives report incredible skill and inexhaustible charm in making memorable this week to the Distaff Delegation . . . to our generous hosts, the Metal Finishing Suppliers' Association for the traditional International Fellowship Open House with which this as other conventions was off to a jovial start . . . to Joan Wiarda for the success of another Plato Party . . . to Oakite Products, Inc. and Aunt Ella for sterling example and edifying precept . . . to Lea Manufacturing Company for its shepherding of our better halves . . . to Hanson-Van Winkle-Munning Company for enterprising and gratuitous journalism . . . and to the individual firms whose lavish bounty still lends to every A. E. S. convention the friendliness and intimacy of a family party . . . to Fred Fulforth and his diligent aides, for a setting and presentation worthy of the rewarding educational program which has been the heart of a rewarding week . . . to Doc Blum, for his safe return from the hazards of aboriginal savage and mythological beast to enlighten us concerning our brothers of the Antipodean branches . . . to Clarence Boerckel, Nat Verrelle and Brooks Ricca, for their enhancement of the convivial delights of the week, for the relaxing smoothness of the Delaware and the stimulating panorama of a beehive waterfront, and especially for their intercession with the special and appropriate Saints who have blessed us with weather passable by any inspector to the narrowest specification and a tolerance of not more than two ten-thousandths . . . to the boys in the background who did for us the dirty and thankless jobs, Ed Ottens who ran the Branch Exhibits, George Long who took the money and had to give it back, Tom Rodgers who housed us, Albert Hirsch and the boys who showed us the industrial titans of the region, Al Pope who kept us posted, Charley Wilmore who booked and badged us, and Bill Trusdell whose stern countenance and firm direction restrained the unruly and re-assured the law-abiding . . . to the City of Philadelphia, to its police and public transport, to its hotels and refectories and especially to its waterfront restaurants for leaving us a little money on which to get home . . . and finally to the metropolis of New York for its fair promise through the seductive accents of George Schore that another year shall see us gathered again in this unique fraternity of the American Electroplaters' Society."

The above resolution of thanks summarizes in the best Gloverian manner the full events of the June 15–18 convention period. A registration total of 1,362, of which 364 were women, was especially blessed with some of the best convention weather in years.

The Opening Session

A bang of the gavel on Monday morning by Dr. Samuel Heiman, General Chairman of the 40th Convention, brought forth the official opening of the sessions. The Reverend Frank Mesle of Oneida, N. Y., a member of the Rochester Branch, pronounced the invocation. Philadelphia Branch President Edwin F. Ottens extended a hearty welcome from his fellow Philadelphians and was followed by Dr. Heiman who introduced the officers. Then the President of the Philadelphia Chamber of Commerce, J. Harry LaBrum, delivered a few remarks of welcome and spoke on "Tomorrow's Challenge in the Delaware Valley".

W. C. Geissman

R. H. Carlson

R. F. Ledford

S. L. Eisler

He outlined the many present developments and future plans for this vital area. Of great interest to all was the second speaker, Honorary Member Dr. William Blum, formerly of the U. S. Bureau of Standards and Official A. E. S. representative to the recent First Federal Convention in Australia. His four month trip to that area was most interestingly delivered and additionally illustrated with excellent color photographs. A short business meeting outlining the procedures to be followed at the final business meeting on Thursday was then observed. A report from the Paper Awards Committee was then read, with presentations made by President Franklyn J. MacStoker. The awards were made as follows: The Carl E. Heussner Award, including the A. E. S. Gold Medal, was granted to William C. Geissman and Robert H. Carlson for their paper, "Current Distribution in Barrel Plating—A Statistical Study". The A. E. S. Silver Medal was awarded to Ray F. Ledford and A. E. Dominik for their paper, "Comparative Wear Characteristics of Some Electrodeposited Metals". The Honorable Mention Award as it was formerly known, and to be known henceforth as the A. E. S. Bronze Medal Award, was granted to Stanley L. Eisler for his paper, "Radioactive Isotope Dilution Method for Determining Sulfate Concentration in Chromium Plating Baths". This award of the Bronze Medal was made possible by action of the Grand Rapids Branch which underwrote the expense of the striking of the bronze medals. The Chromium Plating Award was made to Lloyd Gilbert, W. D. Morrison and Floyd H. Kahler for their paper, "Use of Ion Exchange Resins in Purification of Chromic Acid Solutions". The Precious Metals Plating Award went to Harold J. Wiesner for his paper, "Some Experiences in Heavy Rhodium Plating".

Educational Sessions

From the opening technical session on Monday afternoon through the closing meeting of Thursday morning, the attendance was heavy, with over 400 being counted at presentations of each of the several papers. The first session featured the following papers: "Bright Gold Plating" by Edwin C. Rinker; "Statistical Quality Control—A New Tool for the Electroplater" by Ezra Blount; "A Corrosion Study of Various Chromium-Plated Electrodeposits" by Henry Brown and E. W. Hoover; "Iron Plating from an Alkaline Bath" by Edward F. Foley, Jr., Henry B. Linford and Walter R. Meyer.

The Tuesday morning sessions saw the presentation of the following papers: "Black Chromium-Base Electroplating" by Martin F. Quaely; "Crack-Free Chromium—A New Process" by R. Dow and J. E. Stareck; "Cost Determination in the Industrial Chromium Plating Job Shop" by W. F. Walton and P. B. Lonsbury; "Stability of Ion Exchange Resins Toward Chromic Acid Plating Solutions" by C. F. Paulson and G. H. Saunders.

Four more papers were presented at the third educational session on Tuesday afternoon. They were: "A Study of Cyanide Decomposition" by E. J. Serfass, R. F. Muraca and Walter R. Meyer; "An Evaluation of Carbonate Removal Methods" by R. Scott Modjeska; "A Further Study on the Effect of Abrasive Metal Polishing on the Character of Nickel Plate" by Walter Pinner; and "Plating on Molybdenum" by A. Korbelak.

A special Question and Answer session was held in the evening of that day in which the authors of the various papers served as a panel of experts. Moderator of this session was Dr. Abner Brenner.

The Wednesday morning session featured the presentation of three papers as follows: "An Electronic Thickness Gage" by Abner Brenner and C. Garcia Rivera; "Thickness of Electrodeposits by the Anodic Solution Method" by C. F. Waite; and "Testing Organic Finishes and Interpretation of Results" by Carroll O. Hutchinson.

The Research Educational session on Thursday morning was highlighted by the presentation of a summary report, "The A. E. S. Research Program" by Research Committee Chairman Dr. Donald M. Price, and also included "The Analysis of Electroplating Solutions for Major Constituents" by Earl J. Serfass; "The Effect and Removal of Chromium from Nickel Plating Solutions" by Dr. D. T. Ewing; "A Metallographic Study of Some Steels Used for Nickel Plating" by Dr. A. E. R. Westman; and "A Progress Report on the Development of a New Accelerated Corrosion Test" by Walter Pinner.

Session Chairmen for the first, second, third and fourth educational sessions were, respectively: R. F. Vines, R. M. Wick, G. Schore, and E. R. Bowerman.

Space limitations prevent the publication of more news on the convention. The next issue of this journal will carry other important points that developed at the 40th Convention.

L. Gilbert

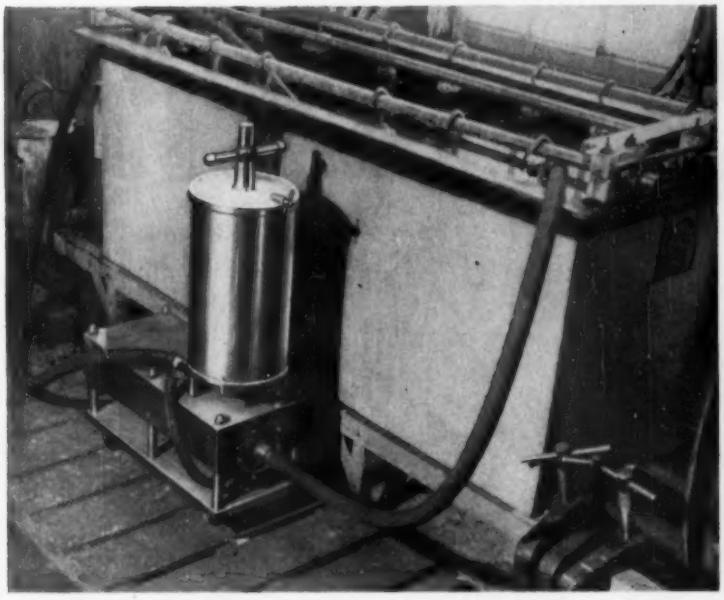
W. D. Morrison

F. H. Kahler

H. J. Wiesner

Here's how to cut your losses

get better finished plated work — save time and labor



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. . . is specifically designed for maximum adhesion in hard chrome plating. It will hold to a fine line and may be easily removed after plating. Dries rapidly. Multiple coats will take any long cycle without treeing.

Note: Both MICCROSTOP and MICCROMASK may be removed easily in MICCROSTRIP A.

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. . . C-562 is the outstanding product for the most efficient method of selective hard chrome plating. Melting at 180°F, it is especially applicable for flat surfaces and sharp edges, where dipping is feasible.

. . . C-600 will take all plating cycles without losing adhesion. Melting at 300°F, it is not affected by temperatures, acids, or caustics used in any plating operation.

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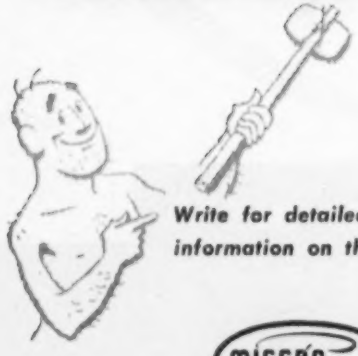

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A. E. S. OFFICERS
1953-1954

George P. Swift
President

Born in Boston, Mass., on August 9, 1903; S.B., 1924, and S.M., 1928, in electrochemical engineering, Sc.D. in metallurgy, 1944, all from M. I. T.

Taught electrochemistry and metallurgy at M. I. T. 1924–1944; begun independent consulting practice in 1930; since 1944 operates electrochemical and spectrographic laboratories in Watertown, Mass.; Director of Alice Ames, Inc., Boston; Executive Secretary, Master Metal Finishers' Association, since 1947.

Officer of Boston Branch, American Electroplaters' Society, since 1941; President 1942–1945; Assistant to Secretary-Treasurer, 1945–1946; Secretary–Treasurer, 1946– . Officer, Boston Section, and Director, A. I. M. E.; active in A. S. T. M. and other societies. Also listed in "Who's Who in New England", "Who's Who in the East", "Who's Who in Engineering", "Who Knows and What", and "American Men of Science".

Ralph A. Schaefer
First Vice-President

Born near Grafton, Ohio, on August 16, 1913; studied first at University of Notre Dame, then at Western Reserve University, which awarded him a B.S. degree in 1935, a M.S. degree in 1936 and a Ph.D. degree, in physical chemistry, in 1941.

With Cleveland Graphite Bronze Company, Cleveland, Ohio, since 1936; Director of Research 1945–1953. Vice President, Clevite-Brush Development Company, 1953– . Known for fundamental work in the practical development of plated bearings and as author of many articles on related subjects.

Past President of the Cleveland Branch, A. E. S.; member A. E. S. Research Committee 1946–1949, Chairman of its Project No. 11, Research Supervisor 1950– ; Associate Editor of PLATING 1946– . Held many offices in the Electrochemical Society; active in A. S. T. M. and many other technical and scientific societies.

Clyde Kelly
Second Vice-President

Born in Indiana County, Pa., on September 9, 1902. Has educational background that includes several technical extension courses.

Employed with the Superior Plating Company, Chicago, as Superintendent.

Twice president of the Chicago Branch A. E. S.; General Chairman of the 1952 National Convention and Exposition at Chicago. Recently honored by the Chicago Electroplaters Institute as "Plating's Man of the Year". Also Chairman of the Research Finance Committee.

Samuel Heiman
Third Vice-President

Born in Philadelphia, Pa., on December 18, 1909. Studied at University of Pennsylvania which awarded him a B.S. in Chemical Engineering in 1930 and a Ph.D. degree in Physical Chemistry in 1948.

Employed with A. Kenneth Graham and Associates as research engineer and plating consultant for seven years, at Battelle Memorial Institute as research electrochemical engineer, 1942–1943, and since 1943 at Philadelphia Rust Proof Company as Chief Chemist and Technical Director. Author of many papers on electroplating subjects.

Officer of the Philadelphia Branch, A. E. S. 1945– . President, 1949–1951; General Chairman of the 1953 National Convention at Philadelphia.

Franklyn J. MacStoker
Past President

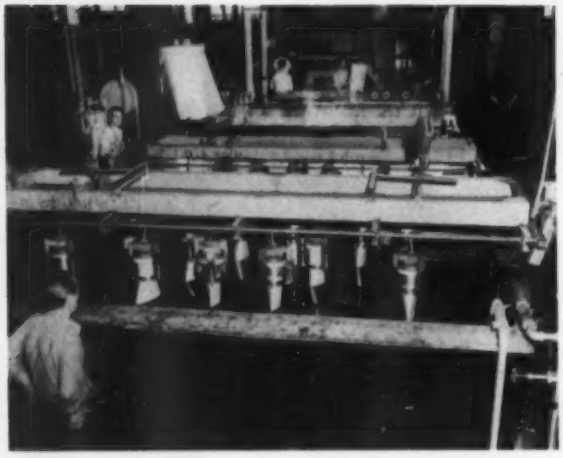
A native of Brooklyn, N. Y., attended elementary and high school in that city, and studied chemistry and metallurgy at Brooklyn Technical Institute and Cooper Union School of Science, New York City.

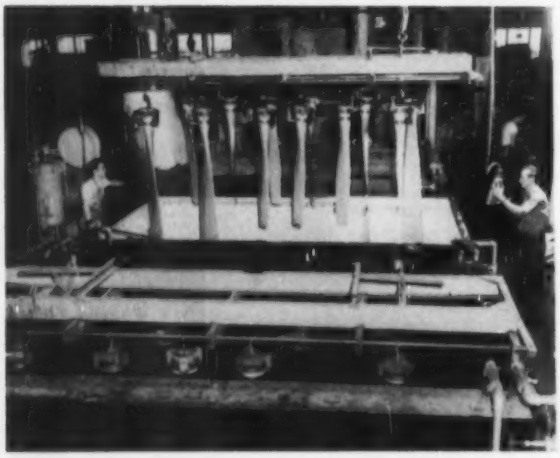
Electroplating Supervisor and Finishing Engineer with New York manufacturing concerns; travelling representative of Magnus Chemical Company, Brooklyn, N. Y., and Colonial Plating Equipment and Supply Company, Boston, Mass.; now Finishing Superintendent, Farrand Optical Corporation, Bronx, N. Y.

New York Branch A. E. S. member 1922; President 1928–1930, Secretary-Treasurer 1934 to date; member A. E. S. Award Committees 1930–1036; General Chairman, A. E. S. Silver Jubilee, New York City, 1937; A. E. S. First Vice-President 1938; member A. E. S. Research Committee 1940–1944, A. E. S Constitution Revision Committee 1947–1948.

NICKEL PLATING PROPELLER

Close-up taken in anodizing department. Prior to shipment for nickel plating, the duraluminum blades are anodized as a preliminary step to the plating process





Two general views of the anodizing section

The following story represents the combined efforts of many organizations which are deserving of mention for their contributions. Prominent in this work were the engineering staffs of the Hamilton Standard Division of United Aircraft Corporation and the Bart Laboratories Company, Inc. through whose courtesies the photographs are reproduced. Also assisting in the development of the process was Arthur D. Little, Inc.

Introduction

Certain desirable properties of aluminum have made that metal a ready choice for propeller service by aircraft design engineers. However, while aluminum alloy blades for special type aircraft, such as sea planes and flying boats easily withstand the smashing impact of water spray thrown up by rough landings and take-offs, the steady erosive effect of the spray results in the loss of significant areas of the blades. This erosive effect naturally led into research on the problem by the engineering department of Hamilton Standard.

The remedy for the erosion of the aluminum alloy is obvious: increase its hardness. This can best be accomplished by the deposition of a layer of metal such as nickel. In original experimental work, using conventional methods for plating on aluminum the quality of plating required for the severe service conditions could not be produced. Failure of the coating applied in this early work was caused by rapid galvanic corrosion occasioned by the nickel-aluminum couple.

Rubber Bonding Process

Researchers were directed to the ultimately successful solution with the announcement of a process by which metal could be plated on a rubber base made conductive. Preliminary tests of the new method showed such promise, and the program was of such importance to the Air Force and the Navy—for the UF-1 (SA-16) utility-rescue amphibian and the P5M-1 flying boat—that the support of both services for the investigation was extended. Because of requirements during flight, the plated finish had to be absolutely smooth, free of even minute pores, and have unusually high adherence. In addition, it had to have high hardness characteristics

OF ALUMINUM BLADES

to afford abrasion protection which was the original purpose of the coating. To meet these requirements, Bart Laboratories Company, Inc., spent approximately two years in the development of an entirely new "hard nickel" solution which has proven successful for this application, as well as for other developments. Special techniques for applying the nickel plating have also been evolved, to produce a finished surface which exceeds even the most stringent requirements for conventional industrial nickel plating.

Solid duraluminum propeller blades processed with the rubber-bonded plated nickel coating have been made and are in service. After hundreds of landings and take-offs they have demonstrated the coating's protectiveness and durability. Plated blades have emerged from a special Navy testing program unscathed, while unplated blades were severely eroded. Test conditions at the blade manufacturers, far more severe than those encountered in actual service and employing high pressure streams of water and cinders, left coated blades unharmed. Unplated blades, run under identical conditions, lost approximately 20 per cent of their tip area.

In the plating process, labeled, "Alni-clad", it has been shown that the bond produced by the rubber base possesses excellent tensile strength characteristics and will stand up under a wide range of temperatures.

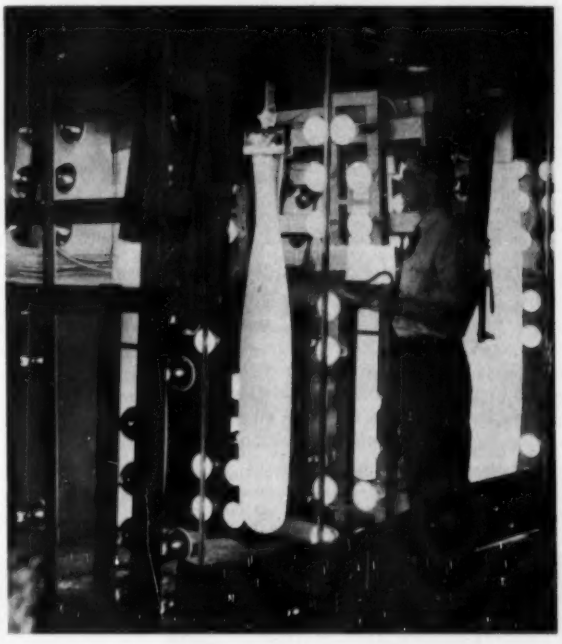
During the process, the bond material is applied to the aluminum to the required thickness. After drying, the blades are then plated with nickel by conventional means. With present facilities a component is now processed in approximately 24 hours. Satisfactory results are obtained with all aluminum alloys used to date. The finished pieces have a high Vickers hardness rating, are stress-free and have a semi-bright surface which can be polished chemically or mechanically to a high luster.

Conclusions

The new process and its variations open up many applications for aluminum which were previously considered impossible or impractical.

The process combines the desired properties of hardness and corrosion resistance of nickel with the advantages of aluminum. Intricate designs can be given uniform and accurate protection on both interior and exterior surfaces by use of the technique.

Blades move on a production-line basis from the bonding material application section to a temporary drying rack. The blades are moved manually from the section with the aid of an overhead conveyor. Every precaution is taken to retain the unblemished surface of the bonding material

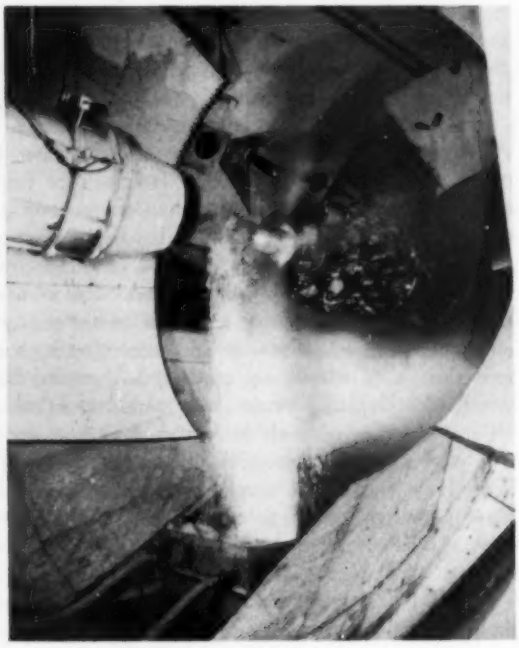


Fast drying for a predetermined time is another step in the bonding process. After the bonding material has been applied, the blades are moved to a drying rack equipped with a battery of infra-red lamps. The lamps are carefully adjusted on the movable racks so that there is even heat distribution over the entire blade. The racks are designed to accommodate various sizes and types of blades

Blades are plated with a special nickel solution. The blades are suspended in the tank shank end up during the plating and agitation is supplied by special movements developed for this process

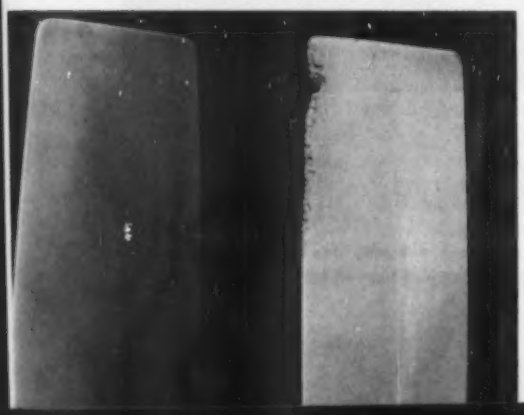
Every finished blade is given a careful visual inspection to detect even minute flaws in the plated surface which are cause for rejection

Following visual inspection, the nickel plated surface is tested for hardness and thickness. The nickel plating has a high Vickers hardness rating and is stress-free. The plating thickness depends upon specific requirements



One of the tests conducted on nickel plated propeller blades in which water jets bombard a Martin P5M propeller at high speed

Aluminum alloy blade tip at right shows damage from high pressure stream of water. Nickel plated blade at left is undamaged after identical treatment



A Martin P5M-1 flying boat, equipped with nickel plated duraluminum propeller blades

project No. 10

project director:
CHARLES A. WALKER*†

associate:
WALTER ZABBAN*‡

location:
YALE UNIVERSITY,
NEW HAVEN, CONN.

Acknowledgment is due the Research Committee, Mr. William Tucker, Eastman Kodak Company, Chairman; the Research Directing Sub-Committee, Mr. B. C. Case, Hanson-Van Winkle-Munning Company and Dr. R. M. Wick, Bethlehem Steel Company, Chairman and Vice-Chairman, respectively; and the Project Committee; Mr. Henry B. Smith, R. Wallace & Sons Mfg. Company, Chairman; Mr. L. A. Danse and Mr. D. Milne, General Motors Corporation, and Mr. F. J. Holt, E. I. du Pont de Nemours & Company, for their contributions to this project.

*AUTHORS

DISPOSAL OF PLATING ROOM WASTES

VI. TREATMENT OF PLATING ROOM WASTE SOLUTIONS WITH OZONE

Introduction

This is the second report of A. E. S. Research Project No. 10 on the removal of cyanide ions from waste plating solutions by reaction with an oxidizing agent. The first paper[1] was concerned with the oxidation of cyanide by either chlorine or a hypochlorite reagent. The oxidizing agent used in the present investigations was ozone, a gas whose oxidation potential is second only to that of fluorine. It is formed in nature whenever a lightning discharge passes through the air, and it can be produced in the laboratory by passing dry air or oxygen between two plates electrically charged (several thousand volts) from a source of alternating current.

Ozone has been used for over 50 years in laboratory work. It is only recently that it has been used in commercial quantities because of rapid advances in the method of manufacture which has made it possible to produce tonnage quantities of this reagent. It may become competitive on an economical basis with common oxidizing agents such as chlorine, hypochlorites, nitric acid, dichromates, permanganates, peroxides and other.

Its present cost varies with the size of the installation but it is of the same order of magnitude as that of the above oxidizing agents.

Ozone is produced commercially from either air or oxygen in the form of a dilute mixture containing about 1 to 2 per cent of ozone by weight, the concentration depending on whether air or oxygen is used. Because of this dilution and the instability of ozone in such a mixture, ozone is not shipped from its point of manufacture but must be manufactured wherever it is used. Standard ozonators with varying capacities are now commercially available; their operation is simple and they require very little maintenance.

Ozone is now used in water purification, oxidation of plant wastes, removal of iron, bleaching of sulfate and sulfite pulps, organic reactions and as a catalyst for some oxidation processes[2]. It has also been used recently, with some success, in the removal of cyanides by oxidation[3].

The purpose of this investigation was to study the mechanism and the extent of the oxidation of free and metallo-com-

†Served as project director while Dr. B. F. Dodge was on leave of absence.
‡Presently with The Chester Engineers, Pittsburgh 12, Pa.

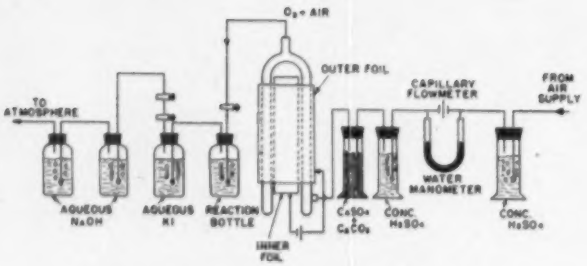


Fig. 1. Apparatus for Ozonation of Cyanides

plex cyanides by ozone and to determine its possible application in the treatment of cyanide waste solutions from electroplating operations.

Review of Previous Work

The only description found in the literature on the oxidation of cyanides by ozone is given by Neuwirth[4] who treated a potassium cyanide (KCN) solution batchwise in the absence or presence of such catalysts as iron and manganese. The ozonator used consisted mainly of a small ozone tube with tin foils and the usual electrical accessories.

The solutions used varied in concentration from 0.1 to 5.0 g/l of KCN (40–2000 ppm CN). High residual cyanide concentrations were obtained in the absence of a suitable catalyst. Better results were obtained in the presence of catalysts and particularly in the presence of manganese where the cyanide concentration of a solution was reduced from 40 to 4 ppm of CN. The catalyst was used either in solution or in the form of an insoluble packing.

The quantitative data presented in the above-mentioned paper are few and too incomplete to allow a comparison of the results obtained. It is believed that residual cyanide, as reported, is actually free cyanide; therefore, the total residual cyanide, when a metallic catalyst is used, may be considerably higher than the free cyanide because of the formation of metallo-cyanide complexes. Furthermore, no mention is made as to the extent of the reaction, whether the oxidation was carried to the cyanate stage or to completion, i. e., to CO_2 and N_2. Some mention is made of foaming occurring at the lower part of the reaction tube because of CO_2 formation and this may be an indication that at least some of the cyanide was oxidized beyond the cyanate stage. Also, it is remarked that "ozone reacted quantatively with cyanide", but this remark does not explain whether one atom or three atoms of oxygen per ozone molecule took part in the oxidation and if all of the ozone bubbled through the solution was reacted.

While this paper was being written, the results of a preliminary investigation on the ozonation of cyanide wastes were reported by Tyler et al[5]. An actual cadmium plating solution was used by the investigators. The ozone requirements for the oxidation of cyanide to cyanate varied between 1.26 and 1.96 lb per lb of CN. However, some of these values, according to the authors[5], were inaccurate, and more accurate runs indicated that the ozone requirements were closer to 1.84 lb per lb of CN or 1 mole of ozone per mole of CN. The following equations were postulated to represent the oxidation reactions:

$$CN^- + O_3 = CNO^- + O_2 \qquad (1)$$

$$2CNO^- + H_2O + 3O_3 = 2HCO_3^- + N_2 + 3O_2 \qquad (2)$$

On the basis of the above equations Tyler et al[5] deduced that the stoichiometry of the actual reaction followed the theory that one mole of ozone is necessary to oxidize the cyanide ion to cyanate; however, it is believed that the run on which he based his calculation does not give substantial evidence for his deduction since in that particular run the ozone requirements varied between 1.26 and 1.82 lb per lb of CN up to the point that ozone began to escape from the solution being treated. It should be added that these deductions were given with reservations by Tyler et al[5] until additional runs could be completed.

Other findings were that the oxidation of the cyanide ion beyond the cyanate stage was inefficient and appreciable quantities of ozone escaped unreacted from the solution, and that a *p*H between 10 and 12 favored the efficiency of the process. The following materials of construction were advised for ozonation of cyanide waste solutions: plastics, wood, aluminum, copper, stainless steel or black iron coated with an asphalt-type coating. It was advised that air from the treatment plant should be vented from the building to prevent deterioration of such materials as rubber insulation and other equipment parts.

Toxicity of Ozone

There seems to be some disagreement as to what concentration of ozone in the air is considered to be obnoxious to human beings. The allowable concentration of ozone in air may vary depending upon the presence or absence of other gases. It is also known that some fixation of nitrogen will occur in the manufacture of ozone and the ratio of the concentration of oxides of nitrogen to that of ozone will depend on such variables as temperature and the type of surface inside the ozonator which is in direct contact with the gas being ozonated. According to Thorp[6] a concentration of 1 ppm by weight of ozone containing oxides of nitrogen produces headaches and throat irritation, while pure ozone does not, even on prolonged exposure. According to Watson[7] there is no measurable difference on toxicity of ozone produced from oxygen or air and nitrogen oxides do not have a direct effect on the toxicity of ozone. The pungent odor of pure ozone can be detected at concentrations of about 0.05 ppm.

The maximum permissible concentration of ozone in air (for prolonged exposure), as adopted at the Meeting of the American Conference of Governmental Industrial Hygienists in Chicago in April, 1950, is 1 ppm by volume (about 1.5 ppm by weight) as compared to 10 ppm for hydrogen cyanide[8].

No information has been found in the literature on the threshold toxicity of ozone in aqueous solutions. However, the maximum concentration of ozone that could be present in water treated with a 2 per cent (by volume) ozone-air mixture is about 0.03 ppm, as calculated by using the Henry's Law constant[9], assuming that the value of the constant is not affected by ions that may be present in the solution being treated.

For lack of experimental data the authors of this paper will limit themselves to assume that such a small concentration of dissolved ozone as above can be tolerated by aquatic living organisms.

Theory

Ozone (O_3) is known to undergo some reactions in which only one atom of oxygen takes active part, and some where the whole molecule takes part. It is believed that in many cases the extent of the reactivity of ozone lies between the two types of reactions.

Probably the first type of reaction occurs more widely than the second type, and this unusual reactivity of one of the oxygen atoms in the molecule has been explained[10] on the basis that one atom of oxygen is held by a co-ordinate valence whereas the other two atoms of oxygen are held by a double bond.

Ozone is catalytically decomposed into oxygen by the hydroxyl ion and is relatively stable in acid solutions.

Apparatus, Analytical Procedures and Reagents

The ozonator used was constructed in

TABLE I. TREATMENT OF CYANIDE SOLUTIONS WITH OZONE

Run No.	Type of Solution*	Catalyst		Initial Total CN ppm	Initial *p*H	Air Flow liter / hr	O_3 Added g	O_3 Reacted per cent	Final Total CN ppm	Final CNO ppm	Final *p*H	Lb. of O_3 per lb of CN reacted
		Type	Metallic Ion Conc. ppm									
2	Copper plating	none	none	1000	10.7	23	0.3340	100	125	1420	7.9	1.26
3	Sodium cyanide	$MnSO_4$	10	202	—	23	0.0133	100	170	45	—	1.38
4	Sodium cyanide	$CuSO_4$	10	202	11.6	23	0.0915	100	1	290	11.4†	1.57
5	Sodium cyanide	$CuSO_4$	20	202	11.2	23	0.0906	100	0.3	322	11.1	1.49
6	Sodium cyanide	$CuSO_4$	20	202	10.2	23	0.0885	100	0.3	287	7.8	1.46
7	Sodium cyanide	$MnSO_4$	20	202	10.0	63	0.0885	100	1.3	306	7.8	1.41
8	Zinc plating	none	none	205	11.3	63	0.0848	51.5	93.5	181	11.3	1.31
9	Zinc plating	none	none	205	11.4	63	0.1505	40.3	51	—	11.1	1.31
10	Potassium cyanate	none	none	200 CNO	—	63	0.0394	12.0	197 CNO	197	—	—
11	Potassium cyanate	$CuSO_4$	10	200 CNO	7.0	63	0.0525	42.8	185 CNO	185	5.8	—
12	Potassium ferrocyanide	none	none	200	7.4	63	0.0394	0	198	—	10.4	—
13	Zinc plating	none	none	205	11.0	63	0.1420	54	11.0	—	—	1.32
14	Zinc plating	$CuSO_4$	10	205	10.9	63	0.0645	100	0.5	—	10.8	1.05
15	Sodium cyanide	$CuSO_4$	10	200	10.1	63	0.0654	93.5	10.4	—	9.8	1.08
16	Sodium cyanide	$CuSO_4$	10	400	10.3	63	0.1500	98.6	7.2	—	8.8	1.26
17	Sodium cyanide	none	none	205	—	63	0.0715	62.2	102.5	—	—	1.45
18	Sodium cyanide	none	none	200	12.5	63	0.0675	53.8	86.5	—	12.5†	1.07
19	Sodium cyanide	none	none	4	—	63	—	—	0.1	6.5	—	—
20	Copper plating	none	none	203	—	63	0.0840	100	0.2	—	—	1.30

*Volume of solution: 300 ml; room temperature
†Some NaOH added

the Project laboratory and consisted of a glass tube with tin foil and the usual electrical accessories. It was not water cooled. Ozone was generated from air which had been dried by passing it through concentrated sulfuric acid and anhydrous calcium sulfate as shown in Fig. 1. The ozone-air mixture was bubbled through a sintered glass tubing into a reaction vessel consisting of a 500 ml wide-mouthed bottle. The lines used to carry the ozone-air stream consisted either of glass, or vinyl type tubing*. It was then bubbled through a 5 per cent aqueous potassium iodide solution to measure the amount of unreacted ozone by the determination of the iodine liberated. While the ozonator was being "warmed up" for a run, the ozone-air stream was bubbled through a sodium hydroxide solution to decompose the ozone into oxygen prior to its release to the atmosphere.

It was found that a steady state in the production of ozone (about 1.2 per cent by vol) was reached only after the ozonator had been operated for about one-half hour. A higher percentage of nitrogen pentoxide (0.1 per cent by vol) was produced than in a water cooled unit since higher temperatures favor the formation of oxides of nitrogen.

Ordinary laboratory equipment was used for the analytical determinations.

A glass electrode *p*H meter was used for the *p*H measurements.

Cyanides were determined by the modified Liebig Titrimetric Method using potassium iodide and p-dimethylaminobenzalrhodanine as indicators for macro and semi-micro analysis respectively. Cyanates were analyzed by nesslerization following acidification. Detailed descriptions of these methods may be found in the joint report of A. E. S. Projects Nos. 2 and 10 on "Analytical Methods for the Quantitative Determination of Cyanides and Cyanates in Plating Wastes and in Effluents from Treatment Processes".[11]

Unreacted ozone was absorbed in a 5 per cent aqueous potassium iodide solution and the iodine liberated was titrated with a standard solution of sodium thiosulfate to a starch end point.

Dilute waste plating solutions were prepared from the following synthetic solutions:

1. Copper plating bath ..... g/l
   - Cuprous cyanide 45
   - Sodium cyanide 68
   - Sodium carbonate 30
2. Zinc plating bath
   - Zinc cyanide 60
   - Sodium cyanide 41
   - Caustic soda 79

*Saran or Tygon are known to be satisfactory.

Discussion of Results

A preliminary investigation was undertaken to determine if the oxidation of the cyanide ion took place in the absence of a catalyst. It was found that in the treatment of sodium cyanide and zinc plating solutions a reaction would take place with or without a suitable catalyst, but in the absence of a catalyst some of the ozone would pass through the solution unreacted. A catalyst, however, was not required for the treatment of a copper plating solution.

Two catalysts were chosen among those which are known to be oxygen carriers: copper in the sulfate form, and divalent manganese. The former was chosen in view of the apparent catalytic effect of copper in the treatment of a copper plating solution and because copper is present in many electroplating waste solutions.

It was decided that the effect of *p*H on the oxidation would not be investigated, unless there was evidence of a decided effect, and that the reactions would be studied at room temperature in view of the high cost of heating relatively large volumes of dilute waste solutions.

The results of this investigation are tabulated in Table I. They show that the oxidation of the cyanide ion by ozone is carried only to the cyanate stage. The oxidation of the cyanate ion by ozone seems to be very slow if any, and most important of all, most of the ozone which is bubbled through the cyanate solution leaves unreacted whether a catalyst is present or not (Runs 10, 11). The cyanide radical in the ferrocyanide ion is not oxidized by ozone. It had been found in previous investigations that this ion was not attacked by the hypochlorite ion either[1].

The reagent requirements vary between 1.05 and 1.57 lb of O_3 per lb of CN reacted. If only one atom of oxygen in the ozone molecule reacted*, the reagent requirements would be 1.85 lb of O_3 per lb of CN, whereas 0.62 lb of O_3 per lb of CN would be required if the whole molecule participated in the oxidation†. Although the results are somewhat scattered, it would appear that the types of reactions involved between the cyanide ion and ozone lie somewhere between those which use one mole and those which use one-third of a mole of ozone per mole of cyanide ion.

It will be noticed that in most of the runs the *p*H dropped considerably. This may be due not only to the formation of cyanates which are weaker bases than cyanides but also to the formation of nitric acid through the absorption of nitrogen pentoxide in the solution‡.

In the oxidation of solutions containing metallo-cyanide complexes, the free cyanide ion is oxidized before the complex ion is, as in the oxidation of cyanides by hypochlorites. This was determined by visual observation.

In the oxidation of dilute copper plating solutions, the copper precipitate is colored dark green. This coloration is attained through a color gradation initially starting with ultramarine blue. It is believed that this precipitate consists mostly of copper cyanate and some cupric hydroxide.

In summarizing these results it may be seen that the oxidation of cyanide to cyanate by ozone is instantaneous. The rapidity of the reaction is certainly necessary if ozone is to be used, since the gas is very slightly soluble in aqueous solutions irrespectively of the *p*H and would therefore bubble unreacted from the solution. Such is not the case with chlorine which can be kept in solution by regulating the alkalinity of the solution.

It was found that ozone did not act as a catalyst and that the oxygen in the air-ozone mixture did not take part in the oxidation of cyanide. Previous investigations in the Project laboratory had shown that the cyanide ion was not appreciably oxidized by air in contrast to Smith's[12] claim that the cyanide ion may be oxidized by passing air through a cyanide solution in the presence of ammonium ions at a slightly acidic *p*H and at 60° C (140° F) or above. The oxidation, according to Smith, is believed to take place as follows:

$$2CN^- + O_2 = 2CNO^-$$

$$NH_4CNO = CO(NH_2)_2 \text{ (isomerization)}$$

$$CO(NH_2)_2 + H_2O = 2NH_3 + CO_2$$

Unlike chlorine or hypochlorites, ozone does not leave any toxic products in the treated solutions. Its disadvantage relative to the hypochlorite ion is that it does not oxidize the cyanide ion beyond the cyanate stage in the contact time allowed. However, this should not prove to be too great a disadvantage since the cyanate ion may be hydrolyzed to the nontoxic ammonium ion by acidification to a *p*H of about 3 as described by Dodge and Zabban[1].

Ozone could be used for the treatment of relatively large volumes of solutions containing less than about 5 ppm of cyanide (CN). The resulting solution would contain less than 10 ppm of cyanate (CNO) which is not considered to be a toxic concentration. In the treatment of very dilute cyanide solutions (10 ppm CN), however, care must be exercised in thoroughly absorbing and reacting the ozone, otherwise toxic concentrations of this gas may result near the treating tank. A flow treatment of the solution may be preferable in this case to a batch treatment.

Conclusions

The oxidation of the free and complex cyanide ions by ozone results in the formation of free cyanates, insoluble metallic cyanates and hydroxides. This reaction is very rapid.

The oxidation does not seem to proceed beyond the cyanate stage within the time of contact of the ozone with the solution.

The oxidation of cyanides to cyanates must be catalyzed by such oxygen carriers as copper and manganese if the solution does not contain metals which are known to be oxidation catalysts. If the oxidation is carried in the absence of a catalyst, a large percentage of the ozone will leave the solution unreacted.

The *p*H does not seem to have a detectable effect on the oxidation within the range 7 to 12.5.

Neither ferrocyanides nor ferricyanides are decomposed by ozone.

The ozone requirements varied in these investigations between 1.1 and 1.6 lb per lb of reacted CN, indicating that this reaction is of an intermediate type between the type that uses one atom of oxygen and that which uses the whole ozone molecule.

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*$CN^- + O_3 = CNO^- + O_2$.

†$3CN^- + O_3 = 3CNO^-$.

‡The *p*H should be kept above 10 to keep the volatilization of HCN to a minimum. Per cent by volume of nitrogen pentoxide in ozone-air mixture was about 0.08.

Dr. Oliver P. Watts—A Tribute

By C. F. NIXON

Watts

On February 6, 1953, Oliver P. Watts visited the Chemical Engineering Building on the University of Wisconsin campus and chatted with members of the faculty, some of whom he first knew as students. That night he died quietly in his sleep, at the age of 87.

With his passing, our Society lost its first honorary member, the plating industry one of its first trail blazers. For many years, Dr. Watts was a familiar figure at Branch meetings in Chicago and other cities and at our annual conventions. H. A. Gilbertson recalls seeing Dr. Watts for the first time at the Chicago Branch annual meeting held in the Morrison Hotel on December 14, 1912.

Much in demand as a speaker, Dr. Watts always gave freely of his experience to all who sought his advice. Those of us who had the privilege of studying under him know that he was a teacher in the true sense of the word. He not only instructed but also managed to share his inspiration. One of the real satisfactions in his later years he found in watching the progress of former students; their triumphs were his triumphs.

His associates at the University of Wisconsin, O. A. Hougen, O. L. Kowalke, W. K. Neill, R. A. Ragatz, and C. C. Watson, have prepared a tribute to his memory from which the following is quoted.

"To Oliver Patterson Watts, exploring the complex problems of electrochemistry and corrosion was a work of love and devotion. Reliance upon experimentation and an attempt to find the answers which nature provides always preceded any acceptance of results formulated by the extrapolation of mathematical equations. In the classroom, he insistently stressed the ability to think and to explain by scientific reasoning, and demanded full scientific explanations for all answers without depending upon statements memorized from textbooks. He belonged to the small group of scientists who are always distinguished as such by appearance and behavior. There was no mistaking him for other than a distinguished and scholarly scientist.

"His scientific works, of which 31 papers appear in the TRANSACTIONS OF THE ELECTROCHEMICAL SOCIETY, include studies on the general theories and applications of electrochemistry, rates of corrosion, the rusting of iron, the effects of dissolved oxygen and water line on corrosion, the grading of corrosion-resisting alloys, the behavior of voltaic couples; electroplating, the problems of embrittlement, dezincification, structure of electrodeposits, and the effect of addition agents. In electrometallurgy, he early investigated the production of calcium carbide, carborundum, the borides, silicides and nitrides of metals, and hundreds of alloys.

"In 1924 he received the honorary degree of Doctor of Science from his alma mater, Bowdoin College, in recognition of his scientific achievements.

"He never concerned himself with financial rewards for his endeavors. His consulting services were given without thought of compensation. He developed the hot nickel-plating bath, now used throughout the world and universally known as the 'Watts Bath'. It brought him no monetary compensation.

"Dr. Watts was always fond of the out-of-doors. Until his retirement at the age of seventy, Dr. and Mrs. Watts continued to spend their summers sailing along the coast of Maine. After retirement, the Watts toured by car, with tent and camping outfits, the entire United States and Canada on their summer trips, even penetrating the rough roads leading into the Northwest Territory of Canada. At the age of eighty, Dr. Watts purchased a pair of shoe skates to replace the old detachables which had served him for sixty years. In recent years he spent his winters in Florida away from the extremes of Wisconsin climate. Photography and astronomy were his lifelong hobbies and a source of entertainment for his students and guests.

"Dr. Watts was of that school of rugged individualists in applied science who persist in their own unaided investigational efforts. His devotion to his science, his patient endeavor to teach understanding rather than mere subject matter and to stimulate his students to learn at first hand have without doubt inspired many to make applied electrochemistry their life work. To these, and to his many other friends, the memory of his gentle dignity and kindly spirit will be a lasting symbol of a life well lived."

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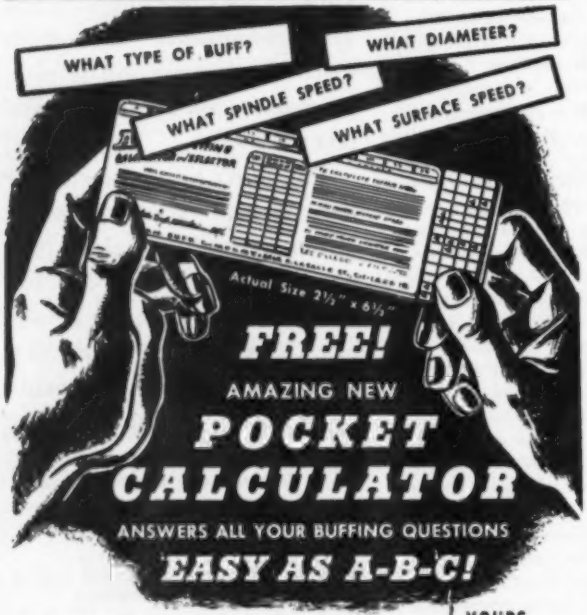

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Book Review

DR. HAROLD J. READ

Professor of Metallurgy, Pennsylvania State College

JOURNAL OF THE ELECTRODEPOSITORS' TECHNICAL SOCIETY, Volume 27, 1950–1951, 337 pages. Institute of Metal Finishing, 32 Great Ormond Street, London, W. C. 1, England. Price to nonmembers, two guineas.

The 17 papers in this volume of the *Journal* are both interesting and diversified. Six or seven of them could be described as primarily fundamental, whereas the others have more immediate bearing on the practical problems of planning, design and operation in the plating plant or in the utilization of deposits. The well reported discussions add immeasurably to the value of the book, and in some cases they are even more stimulating than the formal papers which gave rise to them.

Considerable attention is given to the plating of alloys containing tin, particularly the tin-nickel and tin-zinc combinations. It is refreshing to see how much work is being done on the chemical, physical and mechanical properties of these alloy deposits, for until such investigations are rigorously pursued the development of techniques for the plating of alloys remains little other than an academic exercise. Although American platers may not share the enthusiasm of their British colleagues for the use of tin, they could mark well the thoroughness with which the latter have gone about their investigations.

An increasing appreciation amongst platers of the necessity for learning more about the way in which electrodeposits grow and the relationships of the resulting structures to all of the properties of the deposits is reflected in several papers and in much of the discussion. A great deal of this material is highly controversial, and anyone interested in the fundamental aspects of plating can ill afford to miss the stimulating papers and provocative informal remarks recorded in this volume.

Those whose interests are in the distinctly practical phases of plating will find several papers on specific technical problems such as plating nickel in the bores of tubes, chromium plating large cast-iron rolls, the use of the zincate process in electrodeposition on aluminum, and the factors influencing the design of automatic plating intallations.

Of outstanding interest to the analyst in the plating laboratory is a pioneering paper on the application of chromatography to the analysis of nickel baths. This concise and informative paper is not only valuable *per se*, but it clearly indicates that platers cannot afford to overlook this relatively new analytical technique.

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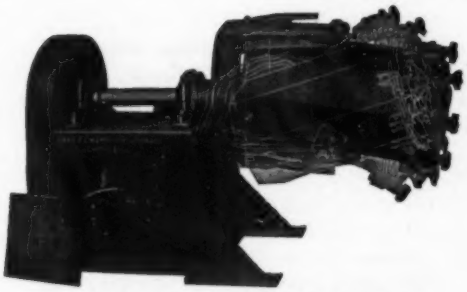

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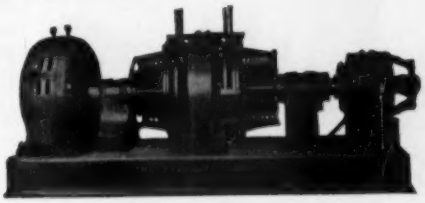

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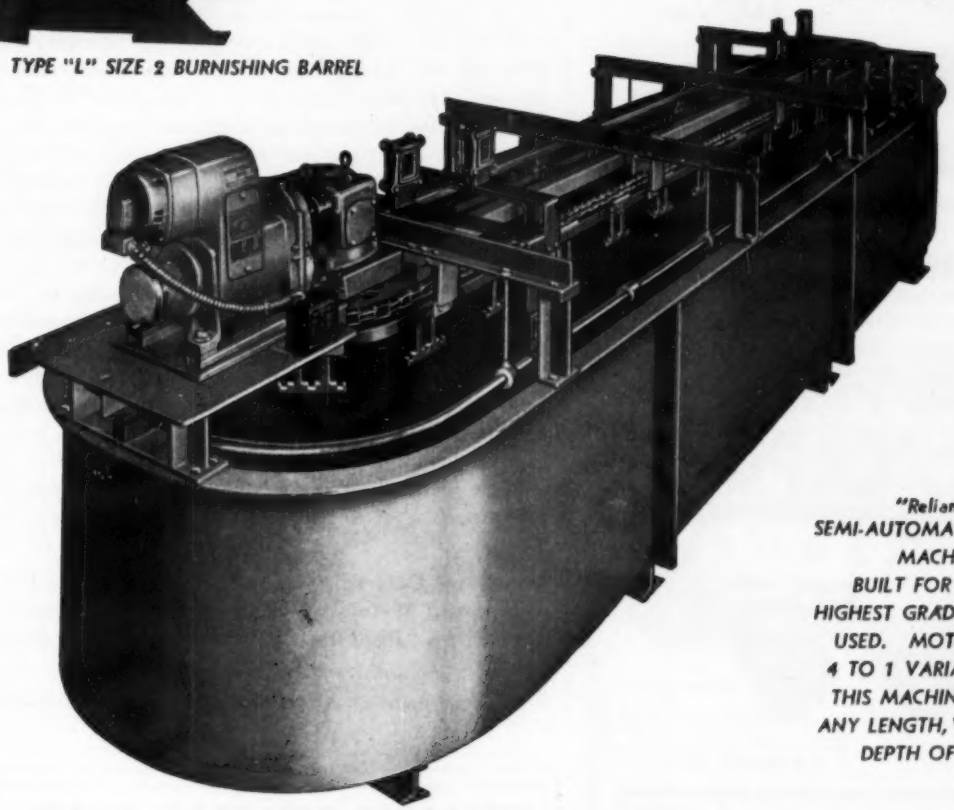

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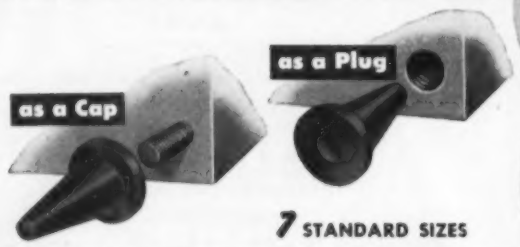

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Article Abstracts

No copies of articles are available at the offices of "Plating". Photostats may be had from libraries having files of the journal in question and offering photostat service, usually at 30-50 cents a page. Ask your public library to consult the Union List for names of libraries having the particular journal. Abbreviations used are those of Chemical Abstracts.

Structural and Kinetic Phenomena Observed During the Anodic Polarization of Metals. H. R. Thirsk and W. F. K. Wynne-Jones. Trans. Inst. Met. Finishing, 1953, **29**, Advance Copy No. 9.

Descriptions are given of a variety of methods which are useful in studying reactions occurring at electrodes. For the structural investigations involved, the methods of ordinary microscopy, electron microscopy, electron and X-ray diffraction are especially valuable. For following the actual progress of an electrode reaction, the ordinary potentiometric or oscillographic methods may be used, but for both these, it is an advantage to stabilize either the current or the voltage. The application of these methods is illustrated by examples of anodic reactions which have been studied in the Newcastle laboratories. This survey brings out clearly the importance of combined electrochemical and structural studies in elucidating the mechanism of the changes occurring at electrode surfaces. In earlier electrochemical work, the inadequacy of techniques then available prevented the exploration of the reaction mechanism under a wide range of experimental conditions. The authors' results illustrate the much greater possibilities arising out of the application of modern methods of experimentation. 19 references, 20 figures.

The Rate- Determining Stage in the Anodic Dissolution of Metals. A. Hickling and J. K. Higgins. Trans. Inst. Met. Finishing, 1953, **29**, Advance Copy No. 10.

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potentiostat technique, of the limiting current densities of metal dissolution in electrolytic polishing solutions. The limiting current densities show the features expected for diffusion currents, and the effect of the addition of the metal dissolution product to the electrolyte indicates that it is the diffusion of this substance away from the anode which determines the overall rate of the electrode reaction. Electrolytic polishing does not occur until the limiting current density has been reached, and experiments with composite anodes show that the diffusion current densities at peaks in the surface are much higher than at cavities. These observations are interpreted by a simple diffusion layer treatment of the kinetics of the anode reaction and their bearing upon the mechanism of electrolytic polishing is reviewed. Some practical recommendations for electrolytic polishing are made. Nine references, 10 figures, 3 tables.

Electroplating on Zirconium. W. C. Schickner, J. G. Beach, and C. L. Faust. J. Electrochem. Soc. **100**, 6, 289–291 (1953).

Methods are described for producing adherent electroplates on zirconium. As-plated adhesion (about 6000 psi) is obtained by prescribed etching of the zirconium surface prior to plating. Prebaking and heat treatment of nickel- or iron-plated zirconium produces alloy bonds of about 50,000 psi (as indicated by modulus of rupture). Other metals are electroplated over diffusion-bonded nickel or iron plate. Two figures, 1 reference.

The Mechanism of Adhesion of Electrodeposits Upon Aluminum. G. L. J. Bailey. Paper presented to the Sheffield Local Section of the Institute of Metals (December 12, 1952). Bull. Inst. Metals **1**, p. 179 (March, 1953). Light Metals Bull. **15**, p. 260 (April 17, 1953).

After giving reasons why plating upon aluminum is likely to prove of increasing commercial importance, the author reviewed methods of plating upon aluminum and theories dealing with the adhesion of the deposits. He went on to illustrate the effects of low and

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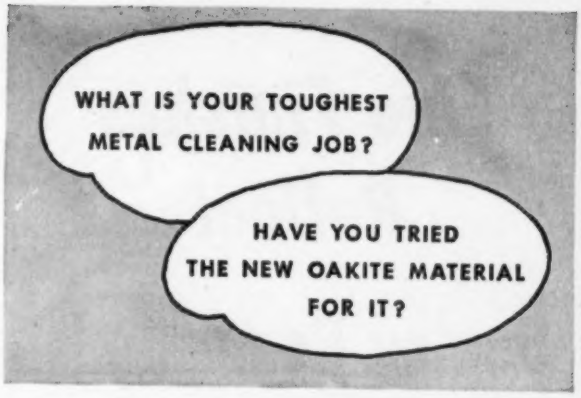

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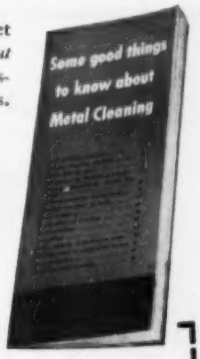

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high nucleation density upon the adhesion of deposits applied using the immersion zincate method, and showed how optimum adhesion could be obtained.

In discussion, speakers referred to factors influencing the density of nucleation and affecting the area of intimate contact between the basis metal and the growing crystals of the electrodeposit.

Complex Fluorides for the Deposition of Tin and Tin Alloys. A. E. Davies, R. M. Angles and J. W. Cuthbertson. Trans. Inst. Met. Finishing, 1953, **29**, Advance copy No. 7.

Further work on the deposition of tin from the stannous fluoborate bath, relating mainly to the effect of addition agents, to anode sludging, and to electrode efficiencies, is described. Preliminary work on the deposition of tin from the stannous fluosilicate bath is outlined.

Some work has been carried out on the deposition of tin-nickel, tin-cadmium, and tin-zinc from fluoborate baths, and on the deposition of tin-cadmium and tin-zinc from fluosilicate baths. This work is still in its early stages and the progress made to date is summarized. Five figures, 2 tables, 11 references.

Note on the Electrolytic Polishing of Aluminum and Its Alloys. A. Pillon. Metaux, Corrosion, Industries **28**, pp. 33–35 (January, 1953). Light Metals Bull. **15**, p. 263 (April 17, 1953).

Risks connected with the use of the original Jacquet bath (perchloric acid-acetic anhydride) are avoided by using acetic acid instead of acetic anhydride. For aluminum and its alloys the author has obtained good results by using a bath consisting of 875 cubic centimeters of glacial acetic acid made up to 1000 cubic centimeters by the addition of commercial 54° B. perchloric acid.

The bath can be used with higher current densities than the original bath with a corresponding reduction in polishing times. Used at low voltages the bath produces grain boundary etching in pure aluminum and in super-purity aluminum base alloys.

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Patent Abstracts

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Copies of patents may be obtained by writing to Commissioner of Patents, Washington 25, D.C. Price 25 cents each.

No. 2,632,728, March 24, 1953—Composition and Method for Electroplating Zinc. Allan E. Chester, assignor to Poor & Company, Chicago, Ill.

This invention relates to new and improved compositions for use in the electrodeposition of zinc from acid zinc solutions . . . increase the brightness . . . and method of electrodepositing zinc at relatively high rates of deposit over a wide range of current densities.

Example 1. A concentrate was prepared by mixing together the following ingredients:

79.5 lbs. Marasperse N (sodium salt of sulfonated lignin having a *p*H of 7)
1,537 lbs. dark molasses
456 cc trifluoracetic acid

Example 2. An electrolyte was prepared by mixing the following ingredients:

240 grams zinc sulfate ($ZnSO_4.7H_2O$)
10 grams zinc gluconate
15 grams aluminum sulfate
5 ml of the concentrate of Example 1
Water sufficient to make 1 liter

The *p*H of the bath was adjusted to *p*H 6.0 with sulfuric acid and the zinc was plated out of this bath at a current density of 40 amperes at a temperature of 70° F, without agitation.

Depending upon the available current densities, within the range of 5 amperes to 5,000 amperes per square foot may be used. It is preferable, however, to operate the bath at current densities within the range of from 20 to 100 amperes per square foot.

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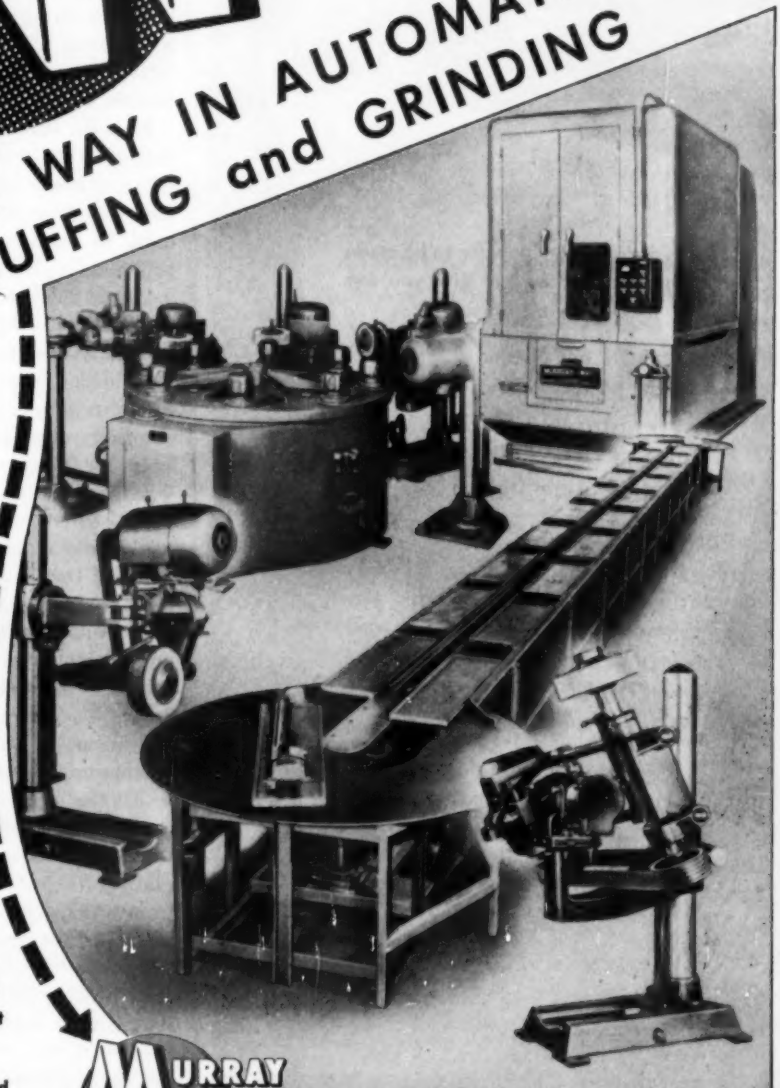

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Patent Abstracts

trodepositing zinc from an acid zinc sulfate bath containing aluminum sulfate, dark molasses and trifluoroacetic acid in sufficient quantities to produce a bright zinc plate.

10 claims. 2 examples.

References cited: U. S. Patents 1,607,869; 2,537,032. Transactions, Electrochemical Society, Vol. 80 (1942), p. 390. Holdeman, Master of Science Thesis, January, 1936, Purdue University, pp. 14–15.

No. 2,636,849, April 28, 1953—The Method of Electroforming Gun Barrels and Liners—A. Brenner, assignor to United States of America as represented by the Secretary of War.

My invention relates to methods of making gun barrels, barrel liners and the like: and it has particular reference to techniques for manufacture of rifled gun barrels and liners from certain relatively hard metals.

Broadly stated, a principal object of my invention is to provide a method for making rifled-bore gun barrels and liners out of metals, such as cobalt, tungsten and molybdenum and alloys thereof, which are too hard to machine or cast by the usual commercial processes.

CLAIM 2. The method of manufacturing a gun barrel having a rifled bore out of metals that are highly resistant to erosion and corrosion but are too hard to machine or cast conveniently, which comprises making a "negative" from whose external dimensions substantially correspond to the required internal dimensions for the gun barrels rifled bore, polishing said "negative" form to a smooth finish, plating upon the outer surface of said negative form a thin layer of fusible metal which does not readily alloy with the metal of the "negative" form; thereafter electropolishing the fusible metal coated "negative" form to a bright and smooth finish, thereafter electroplating the metal which said gun barrel is to be made to a desired thickness upon the outer surface of said fusible metal-coated "negative" form at a temperature below the melting point of said fusible metal coating, thereafter machining smooth the outer surface of the metal which has been electroplated upon the fusible metal-coated "negative" form in order to eliminate the contour of underlying lands and grooves from subsequent plating, thereafter resuming electroplating the metal from which the said gun barrel is to be made as aforesaid until the desired total gun barrel thickness plus a margin for final machining has been reached, thereafter heating the thus electroplated negative form to a temperature high enough to melt and eliminate said fusible metal coating from said "negative" form; thereafter extracting said "negative" form from resultant gun barrel that has been electroformed thereabout, and then machining the outside wall surface of the resultant gun barrel to the desired overall cross-sectional dimensions.

CLAIM 3. The method of Claim 2 in which the electroplated metal from which the gun barrel is to be made is selected from the group consisting of cobalt, cobalt-tungsten alloy and cobalt-molybdenum alloy.

CLAIM 4. The method of Claim 2 in which cobalt is the metal from which the gun barrel is to be made.

CLAIM 5. The method of Claim 2 in which an alloy of cobalt-tungsten is employed as the metal . . . .

CLAIM 6. The method of Claim 2 in which an alloy of cobalt-molybdenum is employed. . . .

Legend. . . . an entire liner 1/8 inch thick, plus a margin for machining the outside wall surface, was plated in approximately three days. However, the actual time per unit product required of an operator during this operation was very low because a large number of liners were accommodated in the single plating bath, and they required no attention during the plating operation.

6 claims, 8 figures.

References cited: U. S. Patents 602,212; 850,912; 1,151,318; 1,412,174. British Patents 12,264; 239,977.

No. 2,636,850, April 28, 1953—Electroplating Copper from Cyanide Electrolytes—George W. Jernstedt and James D. Patrick, assignors to Westinghouse Electric Corporation.

In accordance with this invention, it has been discovered that electrodeposition of copper from aqueous cyanide electrolytes containing copper by periodic reverse current may be greatly improved by having present simultaneously in the electrolyte zinc and thiocyante (CNS−). When operated with periodic reverse current, the presence of both zinc and thiocyanate in particular proportions in copper cyanide electrolytes produces results markedly superior than with either alone.

EXAMPLE 1. An aqueous copper cyanide electrolyte of the following composition was prepared:

Copper (as a metal).....	6 oz per gal
Potassium hydroxide.....	6 oz per gal
Free potassium cyanide....	1 oz per gal
Zinc cyanide.....	Sufficient to provide 0.1 oz per gal of zinc
Potassium thiocyanate....	Sufficient to provide 0.5 oz per gal of thiocyanate (CNS−)

The temperature of the electrolyte was 180° F. Copper was electroplated from this electrolyte using a periodic reverse current of 5 seconds plating and one second deplating. In the range of 13 to 105 amperes per square foot, practically mirror bright copper was produced from the electrolyte; from 105 to 135 amperes per square foot, mirror-bright copper plate that was extremely smooth and uniform resulted; from 135 to 160 amperes per square foot, the copper was again nearly mirror-bright.

The zinc content of the electrolyte of Example 1 was increased to 0.2 ounce per gallon of zinc, and the

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Reply to: ART DIONNE

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thiocyanate content was increased to 1.5 ounces per gallon. Very nearly the same results were obtained in plating over the range of 13 to 160 amperes per square foot.

Claim 1. In the process of electroplating on member electrodeposits of copper from an aqueous copper cyanide electroplating electrolyte, the steps comprising applying to the member the aqueous cyanide electrolyte having dissolved therein from 2 to 15 ounces per gallon of copper, between 0.004 and 0.57 ounce per gallon of zinc, and thiocyanate (CNS^-) in an amount between 0.1 and 10 ounces per gallon, causing electric current to flow through member while in contact with the electrolyte for a period of not over 40 seconds to electroplate copper on the member, then causing a deplating electric current of a sufficient magnitude to flow through the member for a period of time to deliver at least 10 per cent of the coulombs delivered during the preceding plating period to deplate a part of the copper plated on the member, and continuing the alternate plating and deplating until a desired thickness of copper has been deposited on the member, the zinc and the thiocyanate present in the electrolyte in the given proportions resulting in plating a brighter and a smoother electrodeposit of copper.

3 claims, 5 examples.

References cited: U. S. Patents 2,146,439; 2,287,654; 2,347,448; 2,402,185; 2,451,341; 2,524,912. Ser. No. 351,241, Weiner (A. P. C.) published May 18, 1943. Meyer et al, Transactions, Electrochemical Society, Vol. 23 (1938), pp. 384, 400, 401.

No. 2,637,686, May 5, 1953—Process for Producing Drawn Articles—R. J. McKay, Assignor to International Nickel Company.

Claim 1. A process for producing severely drawn articles of composite metal having a high heat conductivity and non-corrosive properties which process consists of cleaning and etching a foundation layer sheet of a metal selected from the group consisting of aluminum and high aluminum alloys and having a thickness of from 0.020 inch to about 0.040 inch, dip-

ping said etched sheet in concentrated nitric acid followed by rinsing in water, anodically treating said dipped sheet in a 35 to 50 per cent phosphoric acid solution at a temperature of about 80° F with a current density of about 12 amperes per square foot for a period of ten to fifteen minutes, electrodepositing a layer of nickel on the plane surfaces of said formation layer sheet and controlling the electrodeposition to produce a thickness of a nickel layer from about 0.003 inch to about 0.004 inch and wherein the thickness of the nickel plating is 10 per cent to 15 per cent the thickness of the foundation layer whereby the tensile strength of the composite foundation metal-nickel sheet is approximately double that of the tensile strength of said foundation layer, electrodepositing a layer of chromium of about 0.0002 inch to about 0.0003 inch on the exposed surfaces of said nickel layer, heat treating the composite sheet at a temperature of about 750° to about 800° F for from fifteen to thirty minutes and deep drawing articles from the sheet so produced.

2 claims, 3 figures, 2 examples.

References cited: U. S. Patents 92,337; 179,462; 1,970,723; 1,971,761; 2,053,096; 2,089,175; 2,462,615; 2,471,663; 2,473,163. Swiss Patent, 79,689. German Patent, 636,664. Electroplating Aluminum published by Aluminum Company of America, 1930, pp. 16, 24, 25, 26.

No. 2,637,687, May 5, 1953—Electrodeposition of Nickel —L. B. Portzer and W. C. Leitenberger, Cleveland, Ohio.

CLAIM 7. A method of electrodepositing nickel from a nickel electrolyte comprising the step of electrolyzing said nickel electrolyte in the presence of a reduced triphenylmethane dye obtained by the reaction of the corresponding triphenylmethane dye with a reducing agent comprising zinc powder and a mineral acid, and a holding agent selected from the group consisting of sodium bisulfite and sodium hydrosulfite.

9 claims, 11 examples.

References cited: U. S. Patent 2,198,268. American Dyestuff Reporter, November 1, 1948, pp. 709, 720, 723, 724.

No. 2,637,689, May 5, 1953—Device for Making Curved Electroplate Shells—R. R. Myers, Jr., Des Moines, Iowa.

CLAIM 1. A holding device for maintaining a flexible flat mold having relief indicia in a curved condition during the plating of a shell thereon, said holding device comprising an impervious trough portion arcuate in horizontal cross-section, a collar on the upper end of said trough overlapping and spaced apart from the inside of said trough, said collar having its length arcuate to conform with the inside arc of said trough and overlapping the upper marginal edge portion of said mold for detachably holding the same in curved condition and closely adjacent the inside of said trough member having a raised flat portion, a headed stud on

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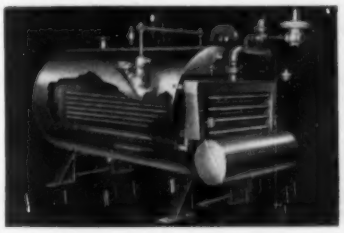

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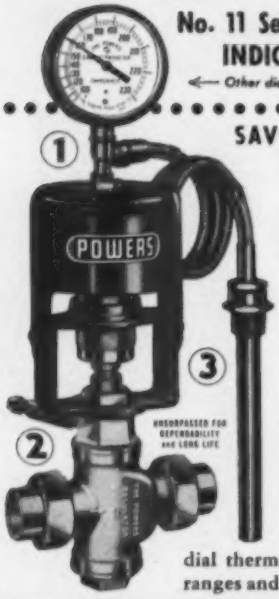

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Patent Abstracts

said flat portion, a spring tongue extending into said trough and yieldingly engaging said mold and having a bayonet slot for detachably engaging said stud, and a spring clamp means connected with said bracket for connecting the same to the support rod of a plating tank.

1 claim, 7 figures.

References cited: U. S. Patents, 1,020,351; 1,354,234; 1,389,266; 1,503,396; 1,520,850; 1,534,918; 1,576,703; 1,720,430; 2,074,335; 2,229,457.

No. 2,639,264, May 19, 1953—Vitreous Enameling and Products—Allan E. Chester, Assignor Poor & Company, Chicago, Ill.

CLAIM 5. A method of controlling the adherence of vitreous enamels to mild alloy steels which consists essentially in subjecting a mild alloy steel having a carbon content between 0.02 per cent and 0.20 per cent to the action of a surface etching bath comprising an acid solution of ferrous sulfate, manganese dioxide, a compound from the group consisting of the soluble salts of zinc, cadmium, aluminum, magnesium, and a buffer capable of maintaining the *p*H of said bath between 5 and 5.5, treating the steel with a dilute substantially non-etching acid solution consisting of nickel and cobalt, the electrodepositing on the steel of a thin coating of a metal from the group consisting of nickel, cobalt and alloys of nickel and cobalt, adding a buffer to the bath from which said thin coating of metal is electrodeposited capable of maintaining the *p*H of the plating bath between 1.8 and 3.5, and firing a vitreous enamel on the plated surface.

8 claims, 4 examples.

References cited: U. S. Patents, 1,837,835; 2,032,256; 2,101,950; 2,127,388. Gregory, Uses and Application of Chemicals and Related Materials (Reinhold), 1939, p. 191.

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1— 120 A. Eager 7½/15 V.	1— 75 A. G. E. 50 V.
1— 100 A. HVW 6 V.	1— 325 A. West. 50 V.
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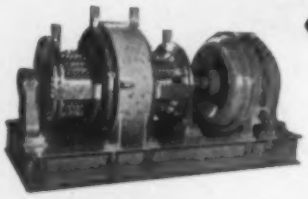

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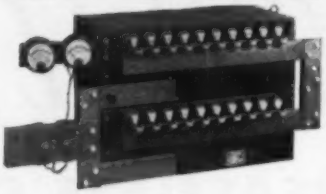

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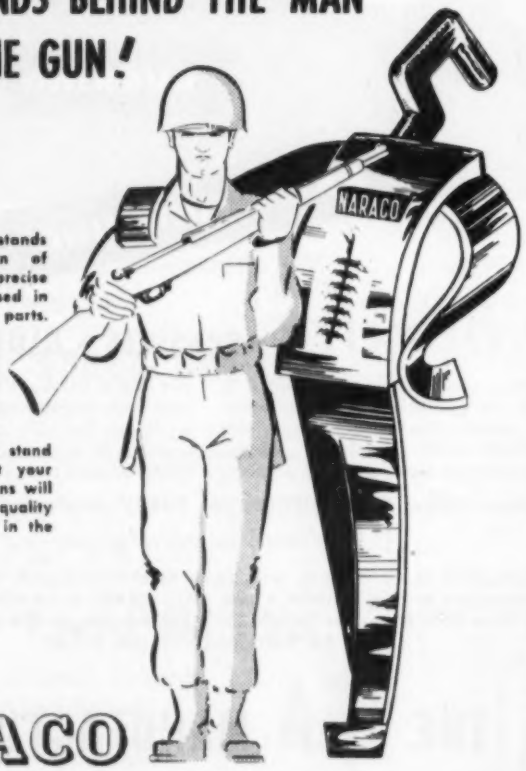

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A.E.S. News

Temporary Charter Request

An organizational meeting of a group in Portland, Ore., has culminated in a petition for a temporary charter which is now at headquarters carrying eighteen signatures.

This continuing interest in the formation of new A. E. S. Branches is heartening and spotlights the value of the Society to platers and metal finishers.

Sustaining Members

Two new sustaining members were added to the growing ranks of sustaining members through reports to Headquarters from the Los Angeles and Toronto Branches. The organizations whose dues go to the support of A. E. S. Research are:

Associated Plating Company, Los Angeles, Calif.

Behr Manning (Canada) Ltd., Brantford, Ontario, Canada

Honorary Members in the News

Two of the Society's honorary members were featured in news from the University of Pennsylvania of the recent commencement ceremonies. Dr. Hiram S. Lukens, Professor of Chemistry at the university, has retired from active teaching after 46 years on the faculty. Dr. Lukens is also known for his activity in other technical groups. He was president of the Electrochemical Society in 1934–1935. He is the author of a score of published articles and holds 23 American, Canadian, British and German patents, chiefly on magnesite cements, writing pens and methods of gold and chromium plating.

Dr. William Blum, with the U. S. Bureau of Standards from 1918 until his recent retirement, received the honorary degree of Doctor of Science from the University of Pennsylvania at its 197th Commencement.

The honor came just 50 years after Dr. Blum's graduation from the university in 1903 with the degree of bachelor of science in chemistry. It was after the earning of his doctorate in 1909 at Utah that Dr. Blum joined the service of the Bureau of Standards.

George B. Hogaboom Stricken

One sad note cropped up during the 40th National Convention at Philadelphia. Mr. George B. Hogaboom was stricken with a heart attack on the morning of Thursday, June 18 at the Headquarters Hotel. He was taken to the Jefferson Hospital at 10th and Sansom, Philadelphia, where he was reported as "resting comfortably" at the time this journal went to press. He was also being allowed to receive a limited number of visitors at the time.

Branch News

COMING EVENTS

DETROIT BRANCH

The Annual Detroit Branch Stag Day will be held at the Glen Oaks Country Club on July 20. Included in the day's events will be breakfast, golf, prizes, games, a bait-casting contest, and a buffet style banquet. Refreshments will be served all day.

Mr. A. J. Emmerich is acting as chairman for the event and is being assisted by J. Siefen, W. Wilson, H. Head, F. Wagner, C. Nixon, L. Borchert, E. Kubis and others.

Tickets may be obtained from J. J. Siefen, 5641 Lauderdale Avenue, Detroit 9, Mich.

ALLENTOWN-READING BRANCH

The final meeting of the 1952–1953 season was held on May 20 at 7:00 P. M. at Scotty's Anchorage in Emmaus, Pa.

The usual fine food was served and after the business meeting, three excellent sound films were shown:

(1) The Story of Nickel
(2) Manufactured Abrasives
(3) This Is Aluminum

JOSEPH E. MCKEONE, *Librarian*

BALTIMORE-WASHINGTON BRANCH

At the May 12th meeting held in the Capitol Room, Statler Hotel, Washington, D. C., THOMAS F. SLATTERY was inducted into the Order of the Pot.

Tom, a charter member of the Branch, served as its president in 1931, as president of the Supreme Society in 1936, was elected an honorary member of the A.E.S. in 1949 and was a charter member of the Bridgeport, Conn., Branch. He was foreman of the electrolytic section of the Bureau of Engraving for many years before becoming its assistant director in 1941, in which capacity he served until his retirement early this year.

At the Board of Managers meeting in Laurel, Md., April 28, the Baltimore members arrived rather early. In fact, it was about an hour early. Seems that Congress did not pass a certain bill in time to change time. The following applications for membership were approved at this meeting: CHARLES W. BRIDGE, WALTER E. POCOCK and ELMER LEROY GABEL, JR., and DAVID H. KINDER, all of Allied Research Products, Baltimore, Md.; BENJAMIN P. MCKNEW, Airtronic Research, Bethesda, Md., and EDWARD E. OBERLAND, Western Electric Company, Baltimore.

BOSTON BRANCH

At the May 7th meeting held at the Hotel Statler, ARTHUR S. KOHLER, Technical Director, Frederick Gumm Chemical Company, Kearny, N. J., was the speaker on the subject, "Background of Barrel Burnishing".

Dr. Walter R. Meyer, A. E. Carlson and R. Stricklen—speakers at the Boston Branch Annual Educational Session

Art talked on some of the detail work and processing necessary before actual production procedures may be practiced. He showed that it isn't only the compound that counts as you also have wa-

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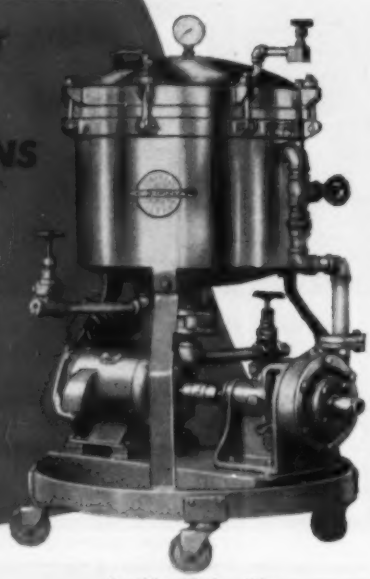


Sparkler Plating Filter
Model 18-D-6 Alliron
600 G.P.H. Portable

HERE'S HOW

★ On a horizontal filter plate it is possible to apply a thin pre-coat with about one-third the filter aid, and in one-third the time required for pre-coating a non rigid media or a surface in a vertical position. This saves time and filter aid.

★ With the Sparkler horizontal plate you can apply this thin pre-coat evenly over the entire plate surface and start filtering immediately with less pressure and obtain maximum consistant clarity right from the start up to the end of the cycle.

★ A filter cake on a horizontal plate will not crack, slip or fall off even with varying pressure or a complete shut-down of the filter. No pre-coat renewal is ever required after an interruption in operation.

★ When it is necessary to clean the filter, the Sparkler filter tank can be emptied in a matter of minutes with a minimum of loss of valuable plating solution.

★ Any grade of filter paper from fine to coarse can be used in a Sparkler filter. This makes it ideal for carbon treatment of solutions. Carbon mixed with water in a stand-by tank is circulated through a clean set of filter paper on the plates until a carbon cake is formed. The solution requiring carbon treatment is then circulated through the carbon beds without contaminating the plating tank or a shutdown of plating operations.

★ At the end of the cycle with a Sparkler filter you can blow-down with air and produce a relatively dry cake that can be disposed of in a trash can rather than washing it down the drain with attendant sewer clogging problems.

★ You will find your Sparkler plating filter positive and dependable from a standpoint of uniform high quality filtering and economical in labor and material.

SPARKLER

Sparkler representatives in all principal cities are ready to give you personal service on your filtering problems, and show how you can make a material saving in operating cost.

MANUFACTURING COMPANY
Mundelein, Illinois

Sparkler International Ltd.
Prinsengracht 876, Amsterdam, Holland

Sparkler Western Hemisphere Corp.
Mundelein, Ill. U.S.A.

ter, acid, oil, finish, type of metal, etc., among many other things to contend with as well as the human angle.

GEORGE P. SWIFT, *Secretary*

BRIDGEPORT BRANCH

A regular business meeting and educational session was held at the Hotel Barnum on April 10, with more than 50 members and guests in attendance. A moment of silent prayer was observed in memory of BEN KUSTERER, who recently passed away.

LIBRARIAN FLOYD ERLENMEYER introduced MR. F. J. MACSTOKER and his aide-de-camp, DR. D. G. FOULKE, who immediately offered a double-barreled presentation of things in the offing regarding the National Society. The branch was brought up to date concerning the recently held interim meeting and also informed about the planned changed in PLATING policy and format.

At the business meeting the following were elected to offices of the Branch:

President—V. CONSALVO
First Vice-President—P. BAILIN
Second Vice-President—F. ERLENMEYER
Librarian—R. BONAZZO
Secretary-Treasurer—R. PARKER
Sergeant-at-Arms—J. MALLICK

ARTHUR TETU and WILLIAM HYATT were accepted active members of the Branch. Resignations of LEROY LONDON and JOHN CHARLESON were accepted.

Past Presidents' pins were distributed to RAY GORAL, C. SCHAEFER, H. GOLDMAN, F. GOTTHARDT, C. TEMPLE and G. WAGSTAFF.

Refreshments were served after adjournment through the courtesy of WILLIAM LINDSAY of the Chemical Corporation.

BOB PARKER, *Secretary-Treasurer*

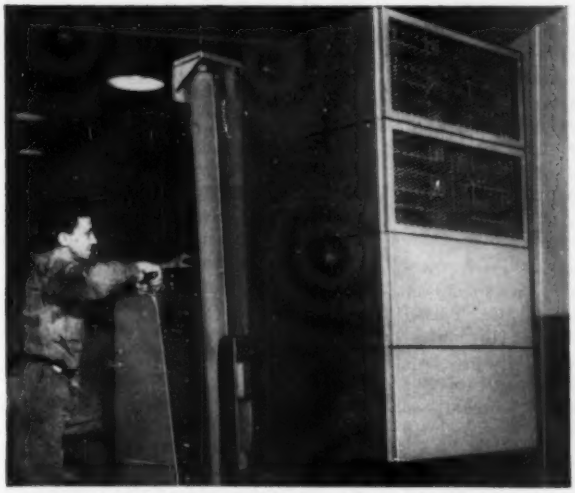
CHICAGO BRANCH

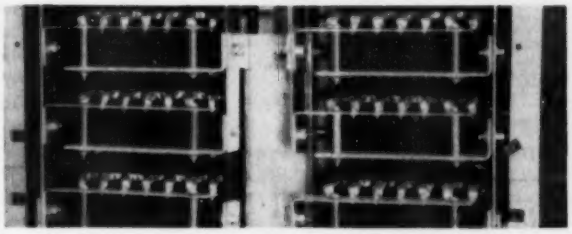
The May 8th meeting featured ED RINKER, technical director of Sel-Rex Precious Metals, Inc., who read a paper on new techniques in bright gold plating. Rinker described a new gold plating bath which has greater stability, no nodular build-up on high current density areas and better metal distribution. One hundred Chicago members paid close attention to his presentation and afterwards examined many sample articles which had been plated with this new process.

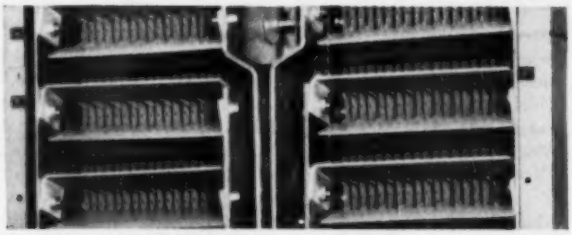
The Membership Committee, under ELMER OLSON, continued their high rate of productivity by announcing five additions to Chicago's rolls. The following were elected to active membership: JEROME KUDERNA of Scientific Control Laboratories; JACK LEICHTI of Wagner Bros., Inc.; CHRISTOPHER MARZANO of Argonne National Laboratories; JOHN C. DUKE of Perfection Heat Treating Company; DAN A. ZARLENGA of Greenduck Novelty Co.

PRESIDENT JOE ANDRUS read a letter

You Save Four Ways with G-E Plating Power Supplies

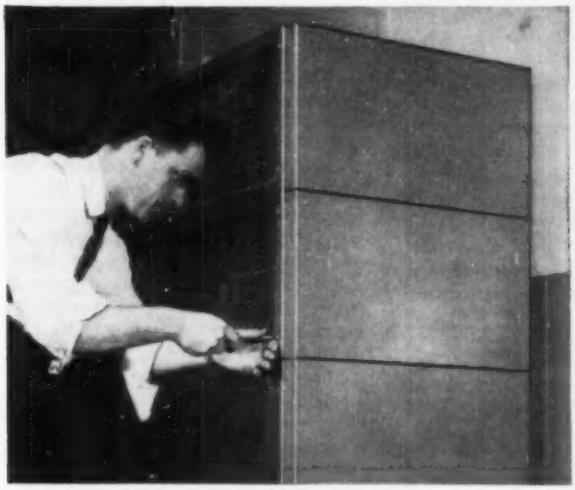


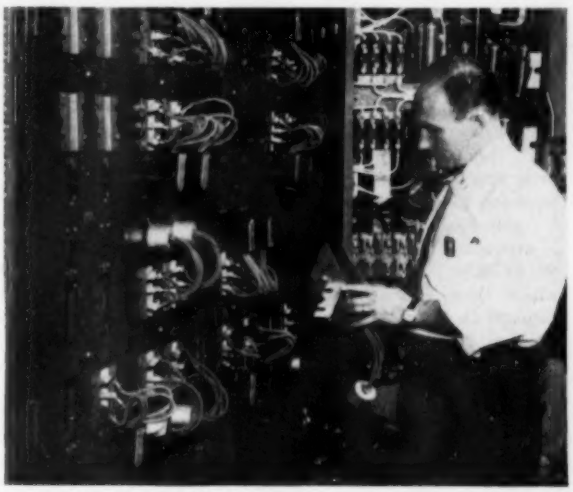




1 SAVE ON INSTALLATION COSTS with G-E Plating Power Supplies. No special foundations are required. Simply move rectifier unit into place with a fork truck, make connections, and it's ready to operate.

2 SAVE ON OPERATING COSTS. Maximum operating economy is obtained in every rating of G-E Plating Rectifiers by using either copper-oxide (top) or selenium (bottom) rectifier cells at their most efficient voltages.





3 SAVE ON MAINTENANCE COSTS. A cooling fan, requiring occasional lubrication, is the only moving part. All parts are corrosion resistant. Cooling design minimizes intake of dirt, dust and corrosive fumes.

4 SAVE ON EQUIPMENT LIFE. At rated output G-E copper-oxide rectifier stacks last almost indefinitely. On test stands G-E selenium rectifier stacks have maintained rated output for over 60,000 hours.

General Electric Plating Power Supplies are available for laboratory plating, barrel plating, and with manual or automatic regulation. For more information contact your nearest G-E Plating Rectifier agent or G-E Apparatus Sales Office, or write Section 464-13, General Electric Company, Schenectady 5, N.Y.

You can put your confidence in—

GENERAL ELECTRIC

Branch News

from ERNIE LYONS, JR., former Chicago branch member, who announced completion of his studies for his Ph.D. degree. Ernie is now a professor at Principia College at Alton, Ill., where he is teaching electro-chemistry. The original research done by Ernie to earn his degree concerned electronic shells on metal ions and their relationship to plating bath efficiency.

"THEY WERE THERE"

DOC MONAWECK recently moved to one of Chicago's tonier suburbs, Riverside, Ill. . . . FRAN LANZ now directing his extra energies toward civic improvement as a trustee for the village of Riverside . . . good to see CHARLIE CLINDININ of Crown Rheostat again . . . Chicago Branch meetings continue to attract a goodly share of out-of-town visitors, among them DICK AIKIN and LOU RAGUE of Roth Plating in South Bend, A. S. BRUMM of Kuehne Manufacturing in Mattoon, and DEANE SMITH of American Plating in Des Moines . . . We helped Deane buy a derby hat which he informs us is the style in Des Moines for cutting the lawn . . . PAUL GLAB is now driving a Cadillac and has challenged the board of managers to audit his books . . . Paul insists that he bought it from the proceeds of his last raise as branch secretary . . . The height of sound competitor relationships was noticed when RALPH BELKE and GEORGE STUTZ, JR., arrived arm-in-arm, ate dinner together and left the same way . . . they're also neighbors in Lincolnwood . . . Jimmy August of Promat made an early appearance . . . ED RUZICKA of Appleton Electric relieved of picket duty . . . the KOCOUR brothers, ORV and LES, in attendance . . . TOM FALLBACHER of W. D. Allen Manufacturing taking over where DICK GUETZOW left off . . . GEORGE DUNCAN of Solvox Manufacturing and BILL BARRON of Lyons Band Instrument . . . ART BARTMANN of Bell & Howell . . . AL D'ANNA of Yale Polishers & Platers . . . E. W. GRIESE of Metalcraft and C. R. SILHAVY of Tuttle & Kift . . . KEN EDSTROM of Mall Tool and R. H. FISHER of Arrow Plating.

DETROIT BRANCH

PRESIDENT L. C. BORCHERT called the May meeting to order at 8:30 P. M. in the Hotel Statler with approximately 140 members and guests present. SECRETARY-TREASURER R. J. RACINE read the names of four applicants for membership. All were unanimously elected into the Branch.

Borchert announced the following appointments to Committees:

Assistant Secretary-Treasurer—E. J. KUBIS
Publicity Chairman—R. O. WATSON
Assistant Publicity Chairman — CARL ANDERSON
Christmas Party Chairman—H. J. MCALEER
'54 Stag Day Chairman—R. H. DUDLEY

Stag Day Committee Report: GENERAL CHAIRMAN A. J. EMMERICH announced that the first notice had been sent out and that all the other necessary preparations were being made for the biggest party yet, which is to be held at the Glen Oaks Country Club.

The Committee on History of the Branch was dissolved and Borchert commended BERT LEWIS for a fine report.

Announcement of the death of FRANK RICHARDS of Chrysler Corporation, past member of the Detroit Branch; and the passing away of OLIVER P. WATTS who did much for the science of electroplating was made.

EDUCATIONAL CHAIRMAN FRED OLMSTEAD opened the evening with a Chrysler Corporation color film on the "Pacific Islands of World War II". He then introduced the principal speaker, JOHN DURANT, Assistant to the Director of Research, National Research Corporation, Cambridge, Mass.

Durant began his talk on "Vacuum Metallizing" by describing and explaining the basic steps of the operation. With a demonstration unit, he showed how simple the method was by coating some flashlight reflectors and jewelry with a film of aluminum. The demonstration was accomplished by suspending the prepared pieces in an extremely high vacuum and the aluminum that was to form the coating film was evaporated at high temperature near the center of the vacuum vessel. The jewelry was rotated so that all sides would be coated. Although the filament was hot enough to boil aluminum, the work stayed at room temperature.

The talk was concluded with the information that the resistance of vacuum metal films to corrosion and abrasion is only as great as the lacquer overcoating and therefore this process has a limited application at the present.

After numerous questions, concerning the application of this method, the meeting was adjourned at 10:15 P. M.

Refreshments were served following adjournment.

R. O. WATSON, *Publicity Chairman*

GRAND RAPIDS BRANCH

Approximately 60 members attended the March 31 dinner meeting at Finger's Restaurant. Three new applicants unanimously approved as new members were: MELVIN O. BAILY and JACK WEERSTRA of Great Lakes Plating Company, Muskegon, Mich., and HENRY VANDER WAL of the Metalcraft Corporation.

The new officers elected for the year 1953–1954 are as follows:

President—KEITH YHOUSE
First Vice-President—CARL GREEN
Second Vice President—BERNARD JULIAN
Treasurer—ROBERT BLACKFORD
Librarian—LYMAN SPERRY
Assistant Librarian—RUSSEL FANCHER
Secretary—JOHN DYKSTRA
Board of Managers—WALLACE REED, FRED MAY

After the election of officers, Librarian Lyman Sperry gave the results of the return of a postcard questionnaire sent out to all members to determine whether the Branch wished to have the Educational Session of the Branch Annual Party held on Friday night in place of Saturday afternoon. The concensus expressed by the survey was that the greatest majority of members wished to retain the past practice of holding the Annual Educational Session as usual on Saturday afternoon preceding the Banquet.

Speaker for the evening was DR. HENRY BROWN of the Udylite Corporation, Detroit, Mich., who gave a most interesting talk on "The Mechanism of Corrosion of Electrodeposited Metals". He stated that on outdoor tests the corrosion resistance of electrodeposits was about proportional to plate thickness but this was not true of salt spray tests. Here the metal preparation or condition was the greatest factor. He also brought out that a chromium plate directly on stainless steel gave good results, whereas, if a nickel strike preceded the chromium plate, corrosion was terrific due to the fact that the acid nickel solution activated the stainless steel. Another interesting phenomenon was the fact that the acid nickel solution activated the stainless steel. Another interesting phenomenon was the fact that foils of nickel (very pure nickel) would corrode in salt spray due to oxygen cell effect of salt droplets, making the foil appear as a lace curtain. On the other hand, if the foil was plated with chromium, no corrosion was noted. Soot on electrodeposits, as classically shown by a carbon pencil line, will accelerate corrosion by a galvanic battery action. Thin gold deposits on nickel cause rapid failure or pitting of nickel because of porosity of thin plates.

Many members boxed in DR. Brown for a long question period after his talk which everyone felt was one of the most interesting talks ever given before our Branch.

Fellowship continued after the meeting with beer and pretzels and a hot poker game.

CARL GREEN, *Publicity Chairman*

HOUSTON BRANCH

At the May 19th meeting held at the Ben Milam Hotel, the speaker was B. L. ELVIG, Service Representative, Minnesota Mining & Manufacturing Company. His subject, "Use of Coated Abrasives in Electroplating", was well received.

Color pictures of A. E. S. 1952 picnic were also shown at this, the Branch's last meeting until September.

Prior to the dinner and meeting liquid refreshments were served, courtesy of the Minnesota Mining and Manufacturing Co.

INDIANAPOLIS BRANCH

The annual Columbus, Ind., meeting was held at the Arvin Cafeteria on May 6. One hundred and five members and guests enjoyed a delicious dinner and a fine program. JOHN HOLLAND was in charge of this meeting and it is agreed he did an excellent job. At the business meeting one new member was voted into the Society: ROBERT R. SMITH, Indianapolis, and the Lynn Chemical Company.

REX OYLER moved, seconded by LES REYNOLDS, that the membership go on record as thanking all committees for a fine educational session and dinner-dance. Motion passed. Two hundred and fifty-seven tickets were sold for the affair. PRESIDENT DON PATRICK announced that delegates to the national convention are to go uninstructed on any issue presented. Approximately 12 members from the Branch plan to attend the Convention. At this, the last meeting of the present year, Don Patrick expressed his thanks to the Branch for the splendid cooperation given him. He stated he was highly honored by serving the group. AL KRIESE presented Don with a past president's pin.

As the election of officers was the main business of the evening, the following tellers were appointed: ED BRUCK, AL KRIESE and WALTER GULLESON. The results of the election follow:

President—ABRAHAM MAX
First Vice-President—E. LUNDBERG
Second Vice-President—H. KENNEDY
Secretary—EDNA ROHRABAUGH
Treasurer—CARL NIEHAUS
Librarian—ROMAN C. BENDER
Board of Managers—BERT HAWHEE, ROBERT C. BRUCK, JOHN M. HOOD, DONALD L. PATRICK

Discussion and comments followed about changing the annual Columbus meeting to the fall of the year, perhaps in October. TOM EVANS hinted that the coming October meeting might be at the Brown County State Park with a steak dinner and square dancing. It is hoped this will be agreeable to the Branch. This will be settled definitely in the September meeting.

The program of the evening was a demonstration of color television in the Arvin Industries Auditorium. ROBERT MACGREGOR of Arvin gave facts, detail and costs of just what they are doing to get color television on the market. He compared black and white with color TV and explained the additional equipment needed. He believes color sets will be on the market before too long at a much lower cost than at present.

John Holland expressed his thanks to the group for their support of this meeting and to the speaker for his very fine demonstration.

EDNA ROHRABAUGH, *Secretary*

LANCASTER BRANCH

A regular meeting was held at the Thompson Products Company, 1400 N. Cameron Street, Harrisburg, Pa., on April 10, at 6:00 P. M., with a dinner served through the courtesy of the company. After the dinner, the members enjoyed a tour through the plant. At 8:00 P. M. the business meeting was held in the plant cafeteria.

After routine business was transacted, MYRON B. DIGGIN, Technical Director, Hanson-Van Winkle-Munning Company, talked on "Modern Silver Plating". He presented the history of silver plating as well as the comparative costs of precious metal plating. After a general discussion on silver plating, Diggin discussed the types of bright silver plating baths available and the advantages of each. After his talk he answered a number of questions. He also had on exhibit a number of articles plated in the Silver Lume bath.

A final meeting of the season was held May 8 at the Old Mill Inn, Lancaster, Pa., with 26 members attending.

Final business of the year, such as instruction of delegates, picnic, ladies' night, auditing committee, was transacted.

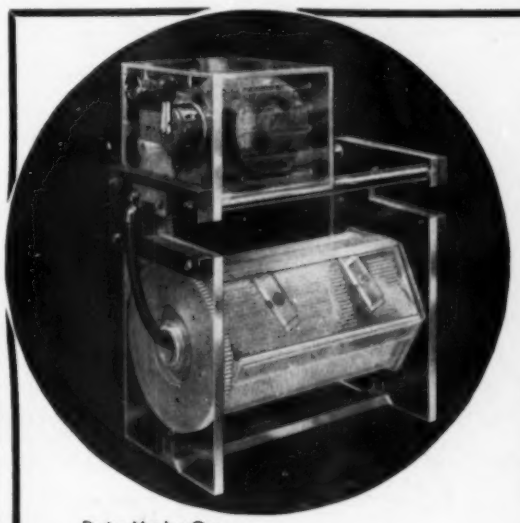
The following officers were installed for the coming year:

President—JOHN REYNOLDS
Vice-President—RAY VINES
Secretary-Treasurer—HARRY SAYLOR
Librarian—GEORGE WELLS
Board of Managers—WILLIAM FORDNEY, CARL HERBST, HARVEY REYNOLDS

After all business was transacted, a round table discussion followed. Many individual problems were discussed.

After the meeting was adjourned, refreshments were served through the courtesy of ROLAND HOENSTINE and CHARLES SNYDER.

HARRY A. SAYLOR,
Secretary-Treasurer



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Cylinder suspended and rotated between heavy side frames designed to serve as a stand support. Side frames are firmly fixed and further braced with a bottom tie bar thereby providing rigid bearing stability.

The STUTZ Portable Plating Barrel

THE STUTZ PORTABLE PLATING BARREL is designed and constructed of High Temperature Lucite to provide continuous processing of piece parts through the operations of Akali Cleaning, Water Rinsing, Acid Treatment and Plating. Progression through these operations is made by manual handling or if necessary with the assist of an overhead traveling hoist. (Hoist attachment available.) The Stutz Portable Plating Barrel is made in 2 sizes with cylinders having inside dimensions of 6" x 12" and 8" x 18". Cylinder can be partitioned. Also 3" or 4" diameter cylinder can be supplied. Standard perforations are 3/32". Smaller or larger openings can be furnished as required. All gears are of 1/2" High Temperature Lucite. Operating temperature up to 185° F.

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LOS ANGELES BRANCH

A regular meeting was called to order by PRESIDENT JOHN MILLHORN at 7:30 P. M. on May 13 at the Rodger Young Auditorium.

There were 57 members and guests present, with introduction of visitors by SERGEANT-AT-ARMS ALEX HELLER.

Ten new members were initiated.

The Branch research chairman reported that he received a $100 check from the Western Metal Congress for help in their recent show. It was recommended that the money be used to purchase a sustaining membership in the National Research Program.

The Librarian then introduced the speaker of the evening, MR. P. A. MALLING of Osborn Manufacturing Company who spoke on the use of brushes for finishing metal parts. Malling classified brushes in four groups and stated that wire brushes were used for the most part in removing burrs on various machined parts, and also in removing rust and scale.

He added that because of the varied applications of power brushes, it is important to select the proper brush for the job to be done and the finish that is desired.

Tampico and cord brushes can be used for producing an ornamental satin finish or a finish of approximately 8 to 10 rms.

Malling presented samples of different brushes, and described the possible jobs that they could be used for. His talk was highlighted by the use of slides which showed the use of brushes on automatic, semi-automatic and hand operated machines.

After the meeting the speaker had a display of parts such as toaster shells, gears, etc., that had been finished using power brushes.

L. TRUMAN STONER, *Secretary*

LOUISVILLE BRANCH

A regular meeting was held April 16, at Korfhages Restaurant, with a dinner being served at 6:30 P. M. PRESIDENT ARTHUR A. OERTEL opened the business and open meeting at 8:00 P. M. with 28 members and guests present.

STANLEY J. BEYER, Chairman of the Nominating Committee, submitted a list of nominees for office for the 1953 fiscal year.

A letter from EXECUTIVE SECRETARY D. GARDNER FOULKE stating that the Louisville Branch heads the third group in competition for new members was ordered to be placed on file.

A. A. Oertel and T. K. ALLISON have completed the purchase of the 60 x 60 projector screen for Branch use.

The newly elected Branch officers for the 1953–1954 fiscal year are as follows:

President—P. H. PATE
First Vice-President—J. W. SCHOLL
Second Vice-President—W. W. FRANCIS
Secretary-Treasurer—J. G. STERLING
Librarian—S. J. BEYER
Sergeant-at-Arms—J. KEHRER
Board of Managers—E. W. ECKERLE, A. A. OERTEL

Delegates and alternate delegates elected to the National Convention to be held in Philadelphia, are as follows:

Delegates—THOMAS K. ALLISON, JOSEPH G. STERLING, STANLEY J. BEYER
Alternates—ARTHUR A. OERTEL, P. H. PATE, GARLAND A. LOGSDON

Educational Chairman Stanley J. Beyer introduced ARTHUR DUROSE of the Harshaw Chemical Company, Cleveland, Ohio, as the speaker of the evening. Du Rose spoke on the subject of "Lead-Tin Alloy Plating" which may be summarized as follows:

1. Lead-tin alloy plating used exclusively on bolts, nuts and bearings and many other parts.

2. Five or six per cent tin in lead deposit is very good and stands up well under salt spray tests.

3. Small glue concentrations in the tin-alloy solutions are important and desirable.

4. If high current density is used, more tin in proportion to the lead will deposit on parts.

5. Strip lead or lead-tin by using sodium nitrate and caustic soda. Anodic

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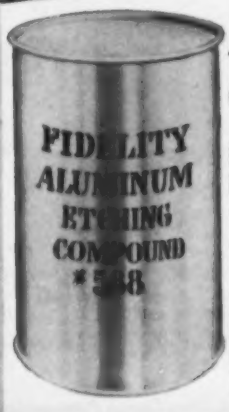

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strip can be used but the resulting smut must be removed before replating.

Slides were also shown during the talk.

Considerable discussion followed and the speaker was given a rising vote of thanks for an unusually interesting talk.

Refreshments were served, courtesy of the Harshaw Chemical Company.

Meeting adjourned at 10:00 P. M.

J. G. STERLING, *Secretary-Treasurer*

MELBOURNE BRANCH

The 77th regular meeting of the Branch was held on April 16 at Melbourne Technical College, with PRESIDENT G. WALKER and 40 members and visitors present.

Speaker for the evening, MR. V. T. PARKINSON, was introduced to members by MR. DALE, and an informative address was given on "Vacuum Metallizing of Plastics". Various types of vacuum pumps were described including the rotary pump used as a backing pump and the vapour pumps working on the diffusion principle. The two chief methods of vacuum coating, namely evaporation and sputtering, were described and compared. In the former the metal is evaporated from a heated tungsten spiral at very low pressure (< 1 micron). In the latter a medium low pressure (approx. 75 microns) is used and pieces of metal are detached and spread around by gas particles ionized at 2,000 volts.

The speaker then gave a demonstration of evaporation in a small 6-inch bell-jar unit. Present-day commercial applications of the process included horn buttons and headlight reflectors on cars, badges and buttons, and cathode ray tubes in television. For reflectors, the surface is smoothed first by a special lacquer coating. Usually a further protective lacquer coating is applied over the metal, which is very thin.

After an interesting discussion period, the meeting terminated with a vote of thanks to the speaker proposed by MR. TEAGUE.

The meeting closed at 10:15 P. M.

NEWARK BRANCH

A regular meeting was held on April 17 at the Robert Treat Hotel.

A pre-meeting film was screened by HOWARD COBB following which PRESIDENT ROBERT HORROCKS called the meeting to order.

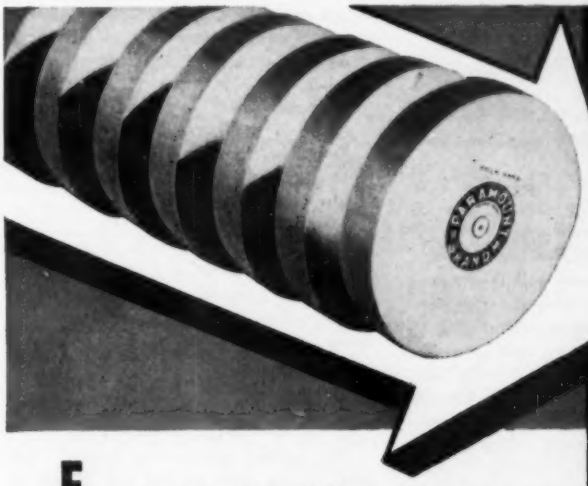
During routine business proceedings, applications for membership in the Branch from CHARLES MEFFLEY, EUGENE GWYER, EDMUND HANLON, MERRITT WARWICK and JAMES NODDINGS were ordered to take the regular course and WILLIAM NATTRASS was elected to membership. LIBRARIAN TOM AUSTIN introduced the speaker of the evening, MILTON NADEL, Finishing Supervisor of Berkeley Industries. In his talk, "Plating on Zinc Base Die Castings", Nadel listed the three essentials of plating zinc die castings as casting of material and inspection; machinery; polishing, cleaning and plating. He also gave various formulae for cleaners, copper strike, and plating, white-brass and nickel solutions; all in all an engrossing talk on the subject.

GEORGE REUTER,
Recording Secretary

PHILADELPHIA BRANCH

A regular meeting was held on April 24 at the Harrison Laboratory of the University of Pennsylvania with 40 attending Five new members were admitted and two applications for membership were received. PRESIDENT OTTENS gave a report of the annual Boston meeting, which Mrs. Ottens and he had attended on April 18. PAST PRESIDENT ALFRED POPE introduced KENNETH HUSTON, who with ARTHUR PIERDON of the Baltimore-Washington Branch, were present for the purpose of presenting PAST SUPREME PRESIDENT FREDERICK FULFORTH, Philadelphia Branch member, with a Pot.

Huston gave a brief history of the Order of the Pot and how a change in the Order's constitution last year had opened its membership to all former Supreme Presidents. The Pot presented to Fulforth was chromium plated on the outside



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The net result of this durability is longer wheel life—longer *useful* wheel life. Try a Paramount Brand Felt Wheel of the proper hardness competitively. Check it against other wheels. We are confident it will show you greater earnings as measured by finished articles per wheel life.

BACON FELT COMPANY

407 West Water Street Founded 1825 Taunton, Massachusetts

"America's Oldest Felt Manufacturer" "Felt Does It Better"

Your Supply House can Furnish Bacon PARAMOUNT BRAND FELT BOBS & WHEELS

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THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS AND RECTIFIERS, WITH FULL CONTROL EQUIPMENT:

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1—6000/3000 AMPERE, 6/12 VOLT, **BOGUE.**
1—5000/2500 AMPERE, 8/16 VOLT, **ELECTRIC PRODUCTS,** 25° C.
1—5000/2500 AMPERE, 9/18 VOLT, **COLUMBIA.**
1—5000/2500 AMPERE, 6/12 VOLT, **EAGER.**
1—5000/2500 AMPERE, 6/12 VOLT, **CHANDEYSSON,** 25° C.
1—4000/2000 AMPERE, 6/12 VOLT, **CHANDEYSSON.**
1—3000/1500 AMPERE, 6/12 VOLT, **COLUMBIA,** Synchronous.
1—2000/1000 AMPERE, 6/12 VOLT, **CHANDEYSSON.**
1—2000/1000 AMPERE, 6/12 VOLT, **MUNNING** "OPTIMUS."

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1—4000 AMPERE, 40 VOLT, **CHANDEYSSON,** Exciter-in-head.
2—1000 AMPERE, 30 VOLT, **IDEAL,** Exciter-in-head.
1—1000 AMPERE, 40 VOLT, **CHANDEYSSON,** 25° C.
1—400 AMPERE, 40 VOLT, **M. G. C.,** Exciter-in-head.

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1—**GREEN SELECTOPLATER,** 1800 AMPERE, 12 VOLT.
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and gold plated on the inside and had been finished by Pierdon. Now that Fred has received a Pot, he is eligible for membership in the Loyal Order of the Pot.

The evening concluded with a showing of International Nickel Company's film, "Corrosion in Action", which was introduced by Dr. Thomas P. May.

I. Wm. Marcovitch, *Secretary*

PITTSBURGH BRANCH

The Branch held its annual Ladies' Night Banquet at the Sheraton Hotel on May 2. Approximately 250 members and guests enjoyed a delicious ham dinner after which they were entertained by a clever group of youthful musicians.

L. J. Schmitt, Sr., presented the past president's pin to outgoing president, R. J. Goldbach.

Every lady present received a useful gift. Several ladies were fortunate enough to win Westinghouse appliances as door prizes.

The last meeting of the fiscal year was held May 14, with 16 members enjoying a dinner before the business meeting which proceeded at 8:00 P. M. with 35 members attending.

Banquet Committee Chairman Bill Wilson was glad to report that the banquet was a success financially as well as socially.

Three new members were happily welcomed into the Branch. They are: Edward A. Dantini, Standard Steel Spring; Frank D. Porter, Lowe Bros. Company; George Karchella, Diversey Corp.

Leo Schmitt then installed the new officers for the next year. Newly installed president, Ed Washburn, took over the meeting from the capable past president, Rex Goldbach.

Members were sorry to hear that Bob Woofter has been ill recently and all wished him a speedy recovery.

It was announced that one of the Branch's most active and well liked members, G. S. Woodruff, is leaving the Pittsburgh district to assume new duties in the Detroit area. "Woody" will be sorely missed by all and best wishes go with him.

The speaker for the evening, Dr. Henry B. Linford, Dept. of Chemical Engineering, Columbia University, chose as his topic, "Evaluation of Cleaning Procedures". It is quite evident that this work from Research Project No. 12 is beginning to bear fruit and work that is being done will benefit all. Dr. Linford displayed charts and graphs which illustrated the merits of the atomizer test evaluation method over other cleaning evaluation methods.

An interesting question period followed the speaker's address.

R. H. Schindler, *Secretary*

SAN FRANCISCO BRANCH

A meeting was held at St. Julien Restaurant, San Francisco, on February 19.

The meeting was called to order by President J. R. Pattenger, and turned over to the evening's speaker, Stuart Pankey. Pankey gave an extensive talk on hard chromium plating, covering solution composition, current densities and masking and current robbing.

The business session of the evening was held after the speaker concluded. E. H. Alexander, J. Ulrich and F. Lane of the Election Committee submitted the following slate of candidates:

President—S. Pankey
First Vice-President—R. Hart
Secretary-Treasurer—H. Smith
Librarian—C. R. McDonald
Board of Managers—J. R. Pattenger, *Chairman*, F. Huntington, J. Ulrich

Nominations were voted closed by the membership.

Selected as Delegates to the Philadelphia Convention were the following: J. Hite, B. Tygstad

Two new applicants voted to membership were Charles Wirth, American Sanitary, and Stanley Franklin, Franklin Plating Works.

The March meeting was held at the El Curtola Restaurant, Oakland, on the 19th.

The meeting was called to order by President J. R. Pattenger, and turned over to the speaker, R. O. Hull of the R. O. Hull Company, Cleveland, Ohio. Dr. Hull gave a good presentation of a subject covering "Tuning Up for Plating Production", and showed a few instruments used to check rectifiers, current densities and plating solution efficiency.

At the business session held after the speaker concluded the following were elected officers for the coming fiscal year:

President—S. Pankey
First Vice-President—R. Hart
Second Vice-President—G. Leghorn
Secretary-Treasurer—H. Smith
Librarian—C. R. McDonald
Board of Managers—J. R. Pattenger, F. Huntington, J. Eldridge

One new applicant was voted to membership: Wm. W. Petrie, San Francisco, Calif.

The meeting adjourned at 11:45 P. M.

Horace J. Smith, *Secretary-Treasurer*

SPRINGFIELD BRANCH

The regular meeting for January was held on the 26th at the Ivy House in West Springfield. Following dinner the regular business meeting was called to order by President Joe Mongeau, Jr., with 37 members in attendance.

The technical subject of the evening was a three reel film called "Corrosion in Action" by the International Nickel Company. All members declared it to be one of the finest films ever seen and that if more were obtainable in the future of equal quality it was quite agreeable to all present to occasionally substitute a film in place of a speaker at regular Branch meetings.

Robert J. Girard, *Secretary*

ST. JOSEPH VALLEY BRANCH

A regular meeting was held May 6, with RICHARD LOCKERBIE presiding.

Minutes of the previous session were read and approved with the correction of the name of the Librarian to DUANE POUCHER.

Two new applications were read: BRUCE EVANS WALLACE, Dowagiac, employed by Kaiser Frazer and CLYDE SWIGERT, Benton Harbor, employed by Twin City Plating.

This meeting was an open forum—DUKE WYSONG acted as Chairman, with the panel members as follows: DR. HAROLD WIESNER, MR. WILLIAM MCDOWELL, MR. JOHN BAYMAN and DR. ERNEST J. WILHELM. The following questions were discussed and satisfactorily answered.

1. How to remove heat treatment scale from silicon steel laminates? Scale accumulates on the edges of an assembly of rod screws through plates that are approximately four inches combined thickness. Answer: Try Enthone No. 134 Rust Remover with periodic reverse by Dr. Wiesner. JIM HEDGES has had success with just a sulfuric acid pickle. Duke Wysong suggested that the heat treating be done in controlled atmosphere to eliminate this scale.

2. Is it necessary to chromic acid dip phosphate coating on cadmium plated steel? Answer—It is necessary if parts are to be painted afterward. A solution of one pound chromic acid per 100 gal of water removes excess phosphate and eliminates blisters in the painting.

3. How many A. E. S. members had received Indiana Stream Pollution Control questionnaire and filled it out? Answer—Practically all had received this questionnaire and several had completed the filling out of this form. The discussion on the first paragraph concerning the part about having a drain in a room where there is a cyanide plating tank showed a difference in opinion as to whether the Control did or did not want a drain in these rooms. The majority were of the opinion that this questionnaire was a forerunner of being required to obtain permission in order to use cyanides. Richard Lockerbie stated that Ohio platers had started through this same question last year and due to the A. E. S. Research and their enlightening propaganda that Indiana would approach this matter from a practical manner. Michigan platers are building cement curbs around cyanide tanks that will hold 1/3 more than contents of tank. Double tanks in the event of leakage of the inner tank have also been installed. Suggested book on "Methods of Treating Metal Finishing Wastes", a manual published by Ohio River Valley Water Sanitation Commission. General Motors is treating cyanide solutions with sodium hypochlorite (3.6 lbs to 1 lb. cyanide). Ralph Brouwer suggested that a speaker from the Stream Pollution Committee for next year would be interesting.

4. How do you remove carbonates from zinc plating tanks in summer? Answers—Suggested use of cooling coils to reduce temperature to about 35° F. Barium hydrate might also do the job. duPont markets calcium hydroxide which can be used.

5. Why should an electric immersion heater corrode out in high speed duPont copper solution? Answer—Must be caused by stray currents.

6. Why should the nickel be cloudy after copper cyanide on steel? Answer—Needs proper cleaning of the copper before going into the nickel.

7. Information on electroforming on vinyl-plastics. Answer—Clean the plastic in TSP solution of 4 to 6 oz/gal at 90° to 100° F for 5 minutes and rinse thoroughly in stannous chloride. Use graphite or silver nitrate and formaldehyde solutions or silver lacquer as conductors. It was also suggested that Interstate Glass Company of South Bend also had a cold silver solution.

8. Information on an abrasive belt with a flexible backing for contour polishing of plastics. Answer—None known. Suggested to try a soft buff with Lea compound.

9. How to clean the heating coil in the still of a dry cleaning tank? Answer—Sand blast and refinish.

Ralph Brouwer suggested the rescheduling of 10-minute question and answer periods at future meetings, because of the satisfactory response to the open forum.

Richard Lockerbie thanked the past officers and membership for their help—and presented the gavel to the new President, Mr. William McDowell. Then the meeting adjourned.

DICK LOCKERBIE, *Secretary, pro tem.*

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Membership Report of the A. E. S.

Membership Competition

BRANCH	Membership Apr. 1, 1953*	New Members	Net Change Membership	Per Cent Net Change
First Group				
Newark	251	7	+ 6½	+ 2.6
Milwaukee	164	4	+ 4	+ 2.4
Los Angeles	236	5	+ 4½	+ 1.9
Detroit	504	11	+ 9½	+ 1.9
Waterbury	130	4	+ 2	+ 1.6
Philadelphia	198	6	+ 2	+ 1.0
Toronto	146	2	+ 1	+ 0.7
Chicago	477	1	+ ½	+ 0.1
Boston	155	..	.....	.....
Bridgeport	158	..	.....	.....
Cleveland	236	..	.....	.....
Pittsburgh	142	..	− ½	− 0.4
Grand Rapids	173	..	− 1	− 0.6
Melbourne	169	4	− 1	− 0.6
Hartford	151	3	− 3½	− 2.3
New York†	352	..	− 9	− 2.8
Second Group				
San Francisco	74	8	+ 5	+ 6.8
Dayton	76	5	+ 5	+ 6.6
Rochester	107	4	+ 3	+ 2.8
St. Joseph Valley	78	2	+ 2	+ 2.6
Cincinnati	92	1	0	0
Twin City	71	1	0	0
Montreal	80	..	.....	.....
St. Louis	109	..	.....	.....
Syracuse	128	..	.....	.....
Baltimore-Washington	93	..	− ½	− 0.5
Indianapolis	105	..	− 1	− 1.0
Saginaw Valley‡	103	2	− 1	− 1.0
Providence-Attleboro	95	..	− 1	− 1.1
Buffalo	106	..	− 2	− 1.9
New Haven	100	..	− 5½	− 5.5
Sydney	82	..	−10	−12.2
Third Group				
Springfield	57	7	+ 7	+12.3
Rockford	63	2	+ 2	+ 3.2
Adelaide	52	1	+ 1	+ 1.9
Columbus	52	1	+ ½	+ 1.0
Southeastern	50	2	0	0
Dallas-Fort Worth	53	..	.....	.....
Hamilton	25	..	.....	.....
Houston	42	..	.....	.....
Jackson-Lansing	61	..	.....	.....
Lancaster	69	..	.....	.....
Louisville§	44	..	.....	.....
Western Ontario	22	..	.....	.....
Wichita	41	..	.....	.....
Toledo	56	..	− 2	− 3.6
Kansas City	46	2	− 2	− 4.3
Allentown-Reading	53	..	− 4	− 7.5
Outside Competition				
Portland	...	18	.....	.....
At Large	138	5	+ 4½	.....
Total A. E. S.	6,065	108	+32½	+ 0.5

Active Membership, May 31, 1953 6,097

*Subject to correction. †, ‡, §Winners in first, second and third group, respectively, of 1952–1953 membership competition.

Elections

ADELAIDE: Stanley H. Le Cornu

CINCINNATI: Robert G. Stringer

COLUMBUS: James C. Zelein

DAYTON: Jack V. Baker, John R. Guss, Alfred E. Hugentober, Duane Prosser, Alfred D. Smart

DETROIT: Albert Borland, Donald D. Clark, Kenneth J. Fox, Curtis E. Hunsaker, George A. Lodge, Richard D. Maloian, Bernard P. Michael, Edwin H. Ponewash, Clement C. Stratman, Louis E. Vance

HARTFORD: Philip A. Geffken, Charles F. Negrelli, J. Ross Sibley

KANSAS CITY: William H. Deterding, Robert Lackey Garrett

LOS ANGELES: Warren Davis, Marshall C. Hovde, Maurice B. Perkins, Burke W. Wombacher

MELBOURNE: A. F. Cummings, Allan K. Jensen, B. A. Leslie, Norman W. Savage

MILWAUKEE: Eli Allen, Frank W. Gutman, Earl J. Montie, Edward Ott, Jr.

NEWARK: Eugene G. Gwyer, Edmund Hanlon, Charles F. Meffley, Jr., William R. Nattrass, James A. Noddings, Merritt J. Warwick, Jr., Julius Zimmerman

PHILADELPHIA: Marion E. Bayne, Charles J. Davoli, William J. Johnson, Paul Karpiak, Frank W. Mountain, Bernard Stepanski

PORTLAND: Darrel E. Anderson, Harold Burkitt, John L. Day, Jr., Herbert R. Finzer, Richard H. Gillmore, John M. Hogl, Ken B. Humphrey, A. F. Killian, Cleta R. Kruger, Howard C. Kruger, Roy J. Layman, Russell Leininger, James Mason, M. A. Pittmon, John R. Scott, Paul F. Staub, Dr. Leif Underdahl, George J. Zeagas

ROCHESTER: John M. Hourihan

ROCKFORD: William Huff, Donald Setterquist

SAGINAW VALLEY: S. E. Beauregard, Francis J. Shannon

ST. JOSEPH VALLEY: Clyde F. Swigert, Bruce E. Wallace

SAN FRANCISCO: Floyd W. Browning, Joseph DiMaria, Stanley P. Franklin, Robert Hart, William T. MacFarlane, William W. Petry, John M. Sterley, Jr., Charles H. Wirth

SOUTHEASTERN: M. H. Dent

SPRINGFIELD: Adin D. Bailey, George V. Clarke, John M. Fitz Maurice, Henry L. Heissfeld, John Ivanits, Ed-

mund L. Maloney, II, Harry Stanley, Jr.

TORONTO: Cyril Chesebrough, Donald Larsen

TWIN CITY: Bernard J. Olson

WATERBURY: Ralph Aconfora, Salvatore N. Commendatore, Harold Rhodenizer, Howard C. von Tobel

MEMBER-AT-LARGE: Gerhard Elssner, Düsseldorf, Germany; John F. Finnegan, Little Falls, N. Y.; William Leitenberger, Lakewood, Ohio; A. E. Matthes, Düsseldorf, Germany; Lloyd B. Portzer, Cleveland, Ohio

Reinstatements

CHICAGO: Louis R. Gallas

DETROIT: Willard S. Garwood (returned from armed forces)

LOS ANGELES: Ernest Francis

ROCHESTER: Arthur A. Chambers, Harold F. Fulton, David Penn

SOUTHEASTERN: Shelton Jones

Transfers

B. C. Case from Newark to Chicago; Edward F. Duffek to Pittsburgh from Chicago; James E. Fritts to Detroit from Columbus; Glenn R. Schaer to Student Status from Columbus; Harry Hansen from Chicago to Detroit; Salvatore Santoro to New York from Hartford; Dwight Couch from Baltimore-Washington to Los Angeles; Joe H. Shockcor to Lancaster from New Haven; James J. Glass to Member-at-Large from Pittsburgh

Resignations

ALLENTOWN-READING: Mrs. Pearl Treisbach

BUFFALO: William H. Kirlin, S. L. Soplop

CINCINNATI: Earl B. Robbins

DETROIT: Arthur H. Lupson

GRAND RAPIDS: Robert H. Lillyblad

HARTFORD: Leo Matuszak, Granville Oakes, Frank Oruzinski

INDIANAPOLIS: Russell L. Bowers

KANSAS CITY: Robert N. Adams, George J. Bruns, M. B. Flint, William G. Simpson

LOS ANGELES: William C. Pollard

MELBOURNE: D. McMillan, C. Williams

PHILADELPHIA: Lenard R. Abbott, Richard B. Blass, Mary Kuonen, Lee M. Raden

ROCHESTER: George Horsley

SAGINAW VALLEY: George A. Goss, J. H. Rhoades, Fred Wagner

SYDNEY: A. G. Baker, J. W. Beattie, G. Johnson, G. J. Winston

TOLEDO: John Stegeman, William Suhrweirer

TORONTO: M. R. Kirk

TWIN CITY: John Bevan

WATERBURY: John Misura, Jr., Michael J. Orient

MEMBER-AT-LARGE: J. C. Maile

Suspensions

ALLENTOWN-READING: Henry S. Huey, Archie Marks, Albert W. Reid

HARTFORD: Dudley Kaharl, Arthur Lamson

MELBOURNE: Mr. Drucker, F. R. Chapman

NEW HAVEN: Francis J. Antinovitz, Richard Johnson, John J. Kuzminski

NEW YORK: Victor Crescas, Charles Favetta, Albert Gould, Ralph A. Heiss, Vito M. Mattera, William A. Raymond, William W. Sellers, Jr., Edgar C. Smith, David Weiss

PROVIDENCE-ATTLEBORO: Edmund H. Moreau (Armed Forces)

SAN FRANCISCO: Philip di Marie, Andrew Guilarte, James MacPherson

SOUTHEASTERN: James Sheton, Paul Stevens

SYDNEY: G. W. Edwards, K. J. Hacker, J. R. Phillips, H. A. Taylor, L. Turner, S. G. Willoughby

Deaths

DETROIT: Frank E. Richards

HARTFORD: James J. O'Shea

MELBOURNE: S. R. Dunn

NEW HAVEN: John W. English, George G. Knecht

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A. E. S. RESEARCH COMMITTEE

Chairman.....Dr. EARL J. SERFASS
Lehigh University, Bethlehem, Pa.

A. E. S. BRANCHES (Changes only)

CLEVELAND meets first Friday of each month in Hotel Carter at 8 P. M. Secretary-Treasurer, A. J. Lupien, 4408 Carnegie Avenue, Cleveland 3, Ohio. Research Finance Committee Chairman, to be appointed.

COLUMBUS meets first Friday of each month at 8 P. M. in Battelle Memorial Institute Auditorium. Secretary-Treasurer, Harry L. Moore, 505 King Avenue, Columbus 1, Ohio. Research Finance Committee Chairman, to be appointed.

LOUISVILLE meets third Thursday of each month in Room 119, Speed Scientific Building, University of Louisville. Secretary-Treasurer, Joseph G. Sterling, 1169 Keller Avenue, Louisville, Ky. Research Finance Committee Chairman, T. K. Allison, 2502 Manchester Rd., Louisville 5, Ky.

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A. E. S. Directory

MILWAUKEE meets first Friday of each month in the East Room, Hotel Ambassador. Secretary-Treasurer, E. E. Piellusch, 2921 S. 90th Street, West Allis 14, Wisc. Research Finance Committee Chairman, to be appointed.

NEWARK meets third Friday of each month at 8 P. M. in Hotel Robert Treat. Secretary-Treasurer, George Wagner, Hy-Grade Electro Plating Company, 35 Fourth Street, Newark, N. J. Research Finance Committee Chairman, John Gumm, 538 Forest Street, Kearny, N. J.

PHILADELPHIA meets fourth Friday of each month in Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Streets (unless otherwise stated). Secretary, I. William Marcovitch, 1434 Lardner Street, Philadelphia 24, Pa. Research Finance Committee Chairman, to be appointed.

ST. LOUIS meets second Wednesday of each month at the York Hotel, 6th and Market, St. Louis, Mo. Secretary-Treasurer, E. R. Hunleth, 4415 Michigan Avenue, St. Louis, Mo. Research Finance Committee Chairman, to be appointed.

SAN FRANCISCO meets second Thursday of each month, alternating between St. Julien Restaurant, 140 Battery Street, San Francisco, and El Curtola Restaurant, 510 17th Street, Oakland. Secretary-Treasurer, Horace J. Smith, 319 Alta Loma Drive, South, San Francisco, Calif. Research Finance Committee Chairman, to be appointed.

SPRINGFIELD meets fourth Monday of each month in the Ivy House, Route 5, West Springfield. Secretary, Roger R. Heroux, 1497 Longmeadow Street, Longmeadow, Mass. Research Finance Committee Chairman, Arthur Pearson, 102 Ely Avenue, West Springfield, Mass.

TWIN CITY meets first Monday of each month, October through June, in the Covered Wagon (Lodge Room), 114 S. 4th Street, Minneapolis, Minn., with dinner at 6:30 P. M. and business and technical session at 8:00 P. M. Secretary-Treasurer, Robert L. Buckley, c/o Industrial Chemical & Equipment Company, 205 11th Avenue So., Minneapolis 15, Minn. Research Finance Committee Chairman, to be appointed.

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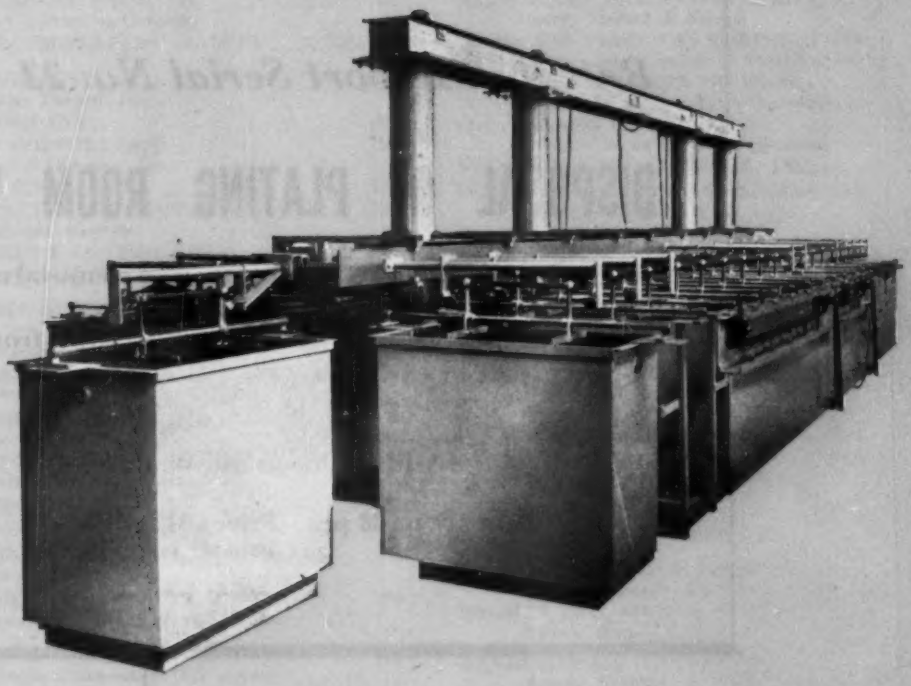

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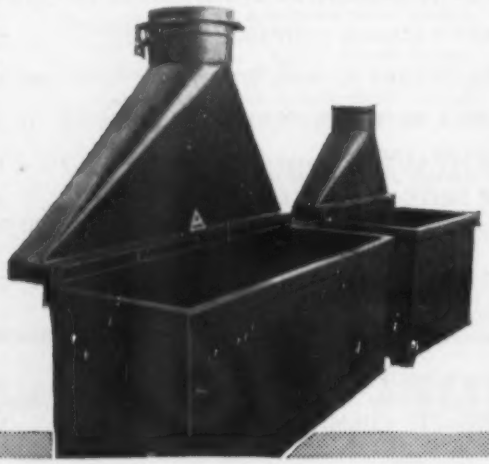

Future Meetings

124TH NATIONAL MEETING—AMERICAN CHEMICAL SOCIETY, September 6–11, 1953 in Los Angeles, Calif.

104TH MEETING OF THE ELECTROCHEMICAL SOCIETY at the Ocean Terrace Hotel, Wrightsville Beach, N. C., September 13–16, 1953.

EIGHTH NATIONAL INSTRUMENT EXHIBIT under the sponsorship of the Instrument Society of America at the Sherman Hotel, Chicago, Ill., September 21–25, 1953.

35TH NATIONAL METAL EXPOSITION AND CONGRESS under the sponsorship of the American Society for Metals, October 19–23, 1953 at the Cleveland Public Auditorium.

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